Railway Mechanical Engineer

Founded in 1832 as the American Rail-Road Journal
With which are also incorporated the National Car Builder, American Engineer and Railroad Journal, and Railway Master Mechanic. Name Registered, U. S. Patent Office

June, 1934

Volume 108 *No. 6*

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Published on the 26th day of the month preceding the date of issue by the

Simmons-Boardman Publishing Company

1309 Noble St., Philadelphia, Pa. Editorial and Executive Offices,
30 Church Street, New York, N. Y., and 105 West Adams Street, Chicago, Ill.

Cleveland: Terminal Tower
Washington: 832 National Press Bldg.
San Francisco: 58 Main St.

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Subscriptions, including 12 regular monthly issues, payable in advance and postage free. United States and possessions: 1 year, $3; 2 years, $5. Canada, including duty: 1 year, $3.50; 2 years, $6. Foreign countries: 1 year, $4; 2 years, $7.

The Railway Mechanical Engineer is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.) and is indexed by the Industrial Arts Index and also by the Engineering Index Service.

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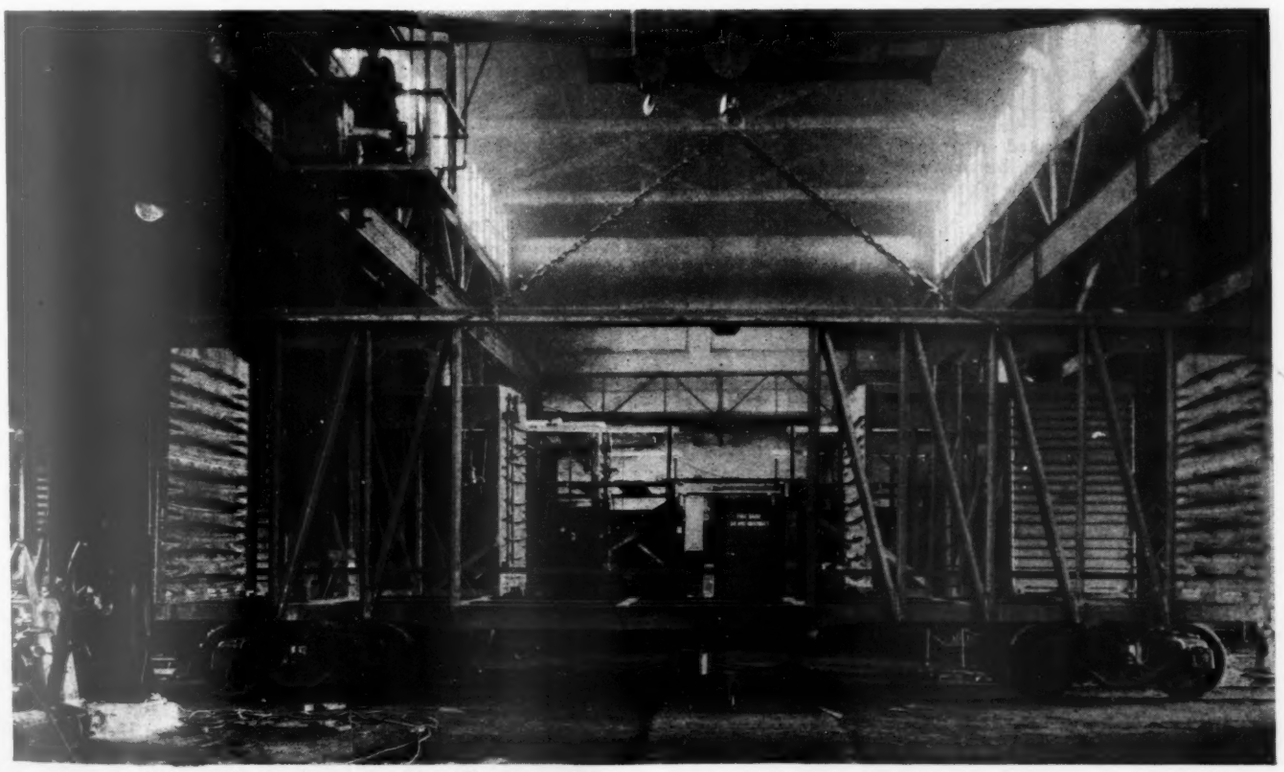
June - 1934

Pittsburg Shops Equipped To Build Automobile Box Cars

Kansas City Southern completes construction of cars having cast-steel underframes and all-welded upper frames

ONE HUNDRED 40-ton, wood, single-sheathed, automobile box cars, notable as the first cars of this type equipped with cast-steel underframes, all-welded steel upper frames and a modern automobile-loading device, were recently constructed at the Kansas City Southern shops, Pittsburg, Kan. The local shop facilities, which were used effectively in building these cars, included a steel car shop, equipped with a Shaw 30-ton over-head traveling crane in the center bay, a large wood shed with permanent scaffolding, modern lighting facilities, pneumatic tools, electric welding equipment, etc. This welding equipment consists of one General Electric 400-amp., two-lead, welding machine, driven by a Buda gasoline engine; two Westinghouse 200-amp., one-lead, portable, all-electric welding machines; and one lead taken from a stationary 400-amp. welding machine in the locomotive shop. Sureweld extruded shielded-arc electric welding rod was used, all welding being done, so far as possible, in special jigs and using special holding clamps which will be described later.

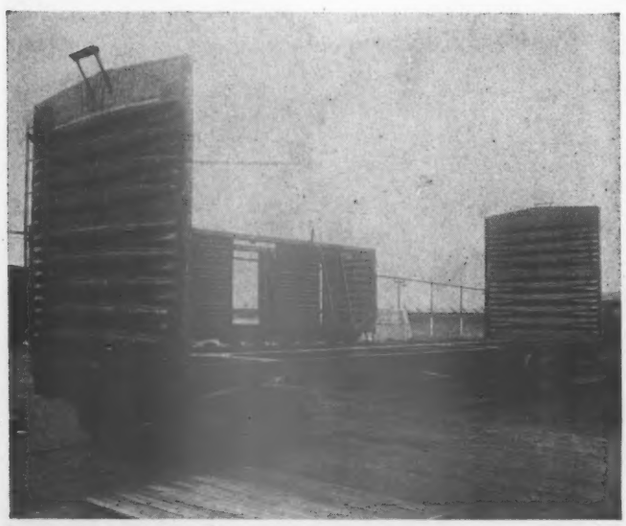
The limiting factor in the welding operations was the fabrication of the side frames, and this job was operated



Applying a side frame to the K. C. S. car with the shop crane

Drilling the inverted cast-steel underframe

Gages *A*, *B* and *C* used in properly positioning various parts before welding



Underframe mounted on trucks with ends applied

on two shifts, using 9 welders, 5 on the day shift and 4 on the night. After the work was fully organized, a maximum production of 10 cars a week was obtained. A total of about 600 lin. ft. of welding and 65 welder-hours per car were required. On an average, 106.5 lb. of welding rod were used per car, about 39 per cent being of the ¼-in. size, used on all horizontal jig work, such as the fabrication of the car sides; 59 per cent being the 5/32-in. size for applying posts and braces, side plates, etc.; and about 3 per cent being the ⅛-in. size, used in overhead welding, such as sealing the joints over the door hoods.

Particular attention was paid to the selection of welders for this work, men being chosen so far as possible who had experience on the all-welded hopper-bottom gondolas previously built at Pittsburg shops. These men were required to make specimen test welds periodically, the welds being pulled and the men rated in accordance with the results, thus giving an opportunity to correct unsatisfactory practice and improve the general standard of welding operation. Tests were also made in the K. C. S. physical laboratory at Pittsburg to determine the comparative strength of conventional riveted construction and electric-welded connections similar to those used in building the automobile cars. These tests are reported to have shown that a 2-in. length of continuous ¼-in. fillet weld is approximately equal to the strength of one ¾-in. rivet in single shear.

In the car structure, the junction of each side post and brace with the side sill is made with a combined length of approximately 24 lin. in. of ¼-in. fillet weld and, in addition to this, a gusset effect is produced at the junction of the flange of the Z-section brace with the flange of the Z-section post at the bottom by shearing the flange diagonally for a distance of 12 in. and electric welding these flanges together. The junction of each side post and brace with the side plate extension plate is made with a combined length of approximately 40 lin. in. of ¼-in. fillet weld.

Method of Constructing the All-Welded Cars

The Commonwealth cast-steel underframes are unloaded upside down immediately south of the steel car erection shed. In this position, holes are drilled in the frames for the draft-gear carrier and brake-cylinder bolts, and the draft gears and draft-gear carriers are applied. The frame is then picked up, turned right side up and set on its permanent trucks, the trucks having been previously assembled complete with brake rigging.

The underframe is then moved into the steel erection shop and a 3-in. by 3-in. by ¼-in. angle welded across the top of each end sill with the back of the angle toward the outside of the car, these angles being used to form a substantial connection between the underframe and the steel ends. The Dreadnaught two-piece steel ends, previously assembled, are then raised into position, squared, and tack-welded in place.

The steel superstructure frames are assembled and welded together on a special jig constructed in such a manner as to insure all parts of the side framing being located in the correct positions. This jig, as shown in one of the illustrations, is composed of three 12-in. structural channels placed parallel to each other and extending slightly longer than the extreme length of the side plate. The channels, after being spaced transversely to support properly the framing when assembled, are secured to Z-bar supports by electric tack welding. This transverse spacing of the two outer channels also gages the distance from the side plate to the bottom ends of the side posts and braces. The longitudinal spacing of the posts and

braces is taken care of by means of spacer blocks welded to the channels. The entire jig, carefully squared and levelled, is mounted upon four shop push cars.

While the fitting up and welding of the framing is being completed on the car, the intermediate floor supports are applied as well as the end-sill grab irons, sill steps, all brake equipment and piping and all other underneath work except the application of the auto-loader floor wells.

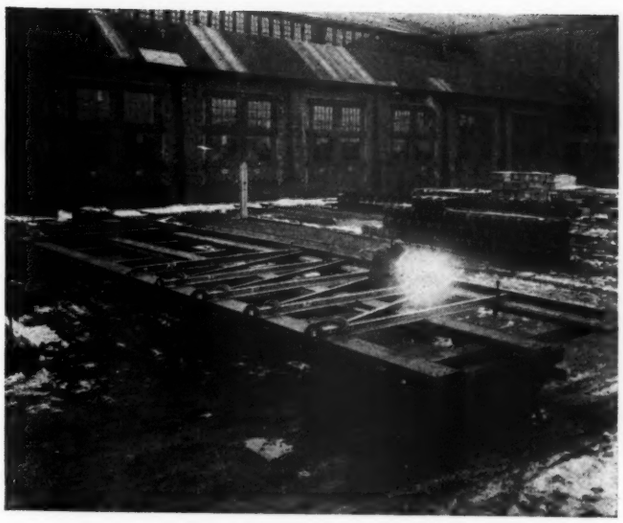
The Youngstown doors are then hung in place and the door tracks applied to the car, the track brackets being secured to the track and to the side sill with 5/8-in. rivets. The doors on each side of the car consist of one main and one auxiliary door, each approximately 6 ft. wide and supported upon a channel-section track with depressions under each door roller in the closed and wide-open positions to relieve the rollers of the weight of the doors when the doors are in either the closed or wide-open position. A lever lifting device is used as a door starter and to lift the rollers out of the depressions. This door-operating mechanism is of the Duplex type furnished by the Railway Metal Products Company.

After the application of the doors is completed, the automobile loading device is loaded into the car and the car switched to the steel finishing track, around which a permanent wide scaffold has been built to facilitate the application of the Murphy all-steel roof. The roof, consisting of 12 sections of No. 13 B. w.g. galvanized steel, extending across the car from side plate to side plate and having a pitch of 6 in. from center of car to eaves, is applied to the car, 3/8-in. rivets being used to secure the edge of the roof sheets to the side plate and to the steel ends. The roof seam caps consist of 3/16-in. steel pressings which are riveted in place as are the steel running-board saddles. While the roof is being assembled, the loader is applied to the steel framing of the car.

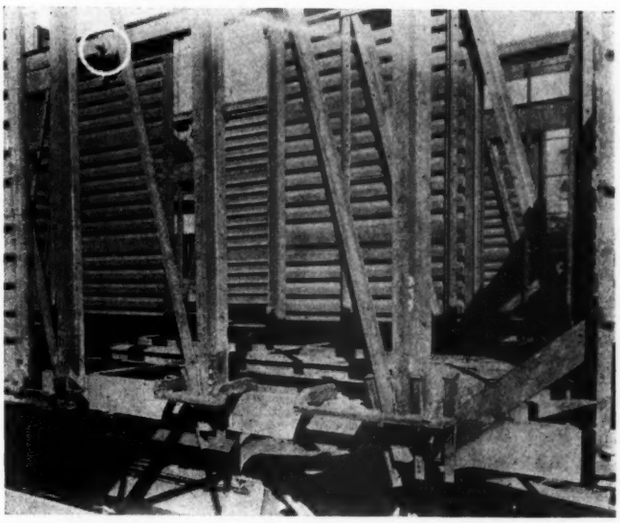
The application of the roof and the loader complete the work done in the steel car shed and the car is then switched to the wood shed lead track where all the weld beads and any rust spots on the framing are sand-blasted, after which all the steel parts are immediately given their respective priming coat of paint or car cement, as required. The sand-blasting of the welds removes the oxidation from the surface of the weld metal that occurs during the welding operation, experience having proven that when the oxidation is not removed it eventually peels off, taking the paint with it.

The car is now ready for application of kiln-dried wood parts and is moved into the wood-finishing shed for completion. The first step in this shed is to secure the bottom sheathing board in place, and, as the bottom edge of this board rests on top of the underframe casting, the contact surfaces at this place are given a liberal coat of Texaco RRX-33 car cement. The decking and the remainder of the side sheathing is then applied along with the end lining nailers and the end lining boards. The side sheathing boards are given a priming coat of paint on the outside surface and on the tongue-and-groove joints prior to their application to the car so that, when assembled in place, the entire car, including both the steel and wood parts, has received the priming coat of paint. The side sheathing boards are secured in place with Leakproof bolts and Grip nuts, the ends of each board being bolted to the steel end flange and the door post and each board bolted alternately to the intermediate posts and braces, the holes for the bolts in the posts and braces and the steel end flanges having been provided in these parts, when purchased.

Each decking board is secured to the underframe with four Interlox floor clips, one at each end of the board secured to the side sill flanges and one on each side of

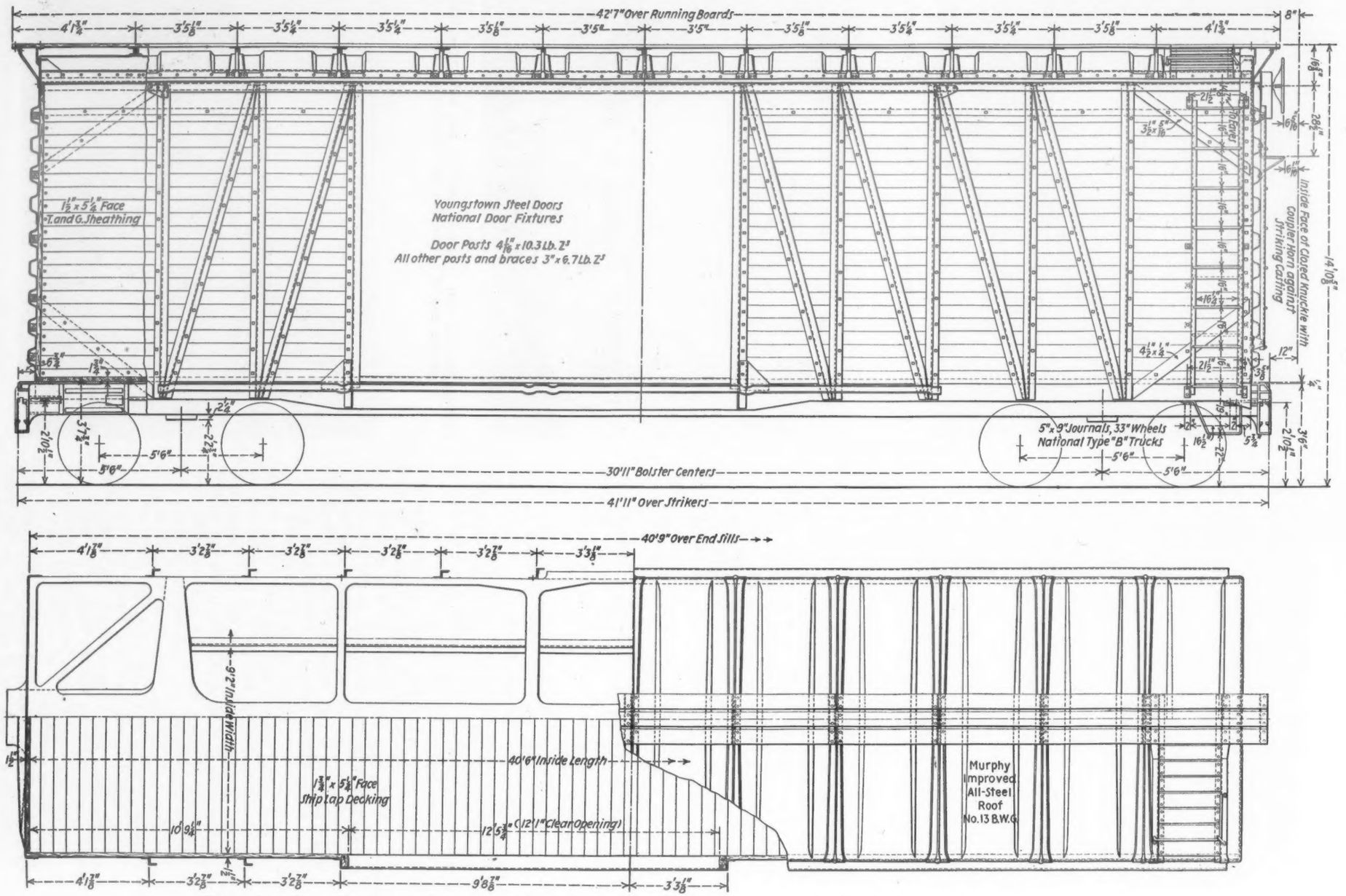


Special jig and clamps used in welding the side frames



Clamps holding side frame in position for welding—circle shows one of the loader fulcrum brackets

Roof and doors applied



Plan, elevation and cross sections of the K. C. S. 40-ton cast-steel underframe all-welded automobile box car

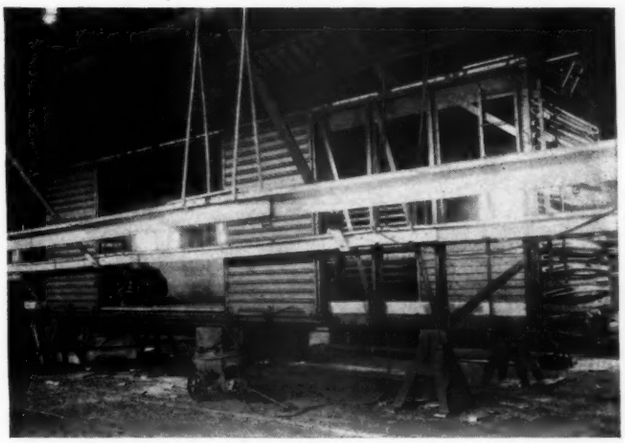
the center sill secured to flanges especially provided on the center-sill casting for this purpose. Throughout the doorways, a pressed-steel threshold plate is provided, the plate extending down over the ends of the boards.

After the decking is laid in place, the auto-loader floor-well locations are marked off by template and the decking cut out at these locations by a shop-made portable air-driven cutter and the wells inserted in place and secured to the underframe casting by U-shaped supports electric welded to the underframe. The application of the post furrings, running boards and placard card boards completes the car except painting and stenciling.

A special Texaco car cement is applied by spraying to the trucks, the cast-steel underframe and the underneath part of the car, and by spray to the outside of the steel roof, one heavy coat completing the work on these parts. The inside of the steel roof is given a priming coat of rust-inhibitive brown paint and a finish coat of non-sweating asphaltum paint, upon which sawdust is heavily sprinkled before the paint is dry. The sawdust functions as an absorbent to prevent condensation from damaging the lading. The remaining steel parts of the car are given a priming coat of rust-inhibitive brown paint all over and two coats of rapid-drying freight-car paint on the outside of the car. The wood sheathing boards are given two coats of rapid-drying freight-car paint.

Principal Features of the Car

The new K. C. S. 40-ton automobile box car is built as high and wide as possible within the recommended American Railway Association clearances for automobile cars and giving due consideration to the special requirements for automobile loading. Each car has an inside length of 40 ft. 6 in., inside width of 9ft. 2 in., and inside height at the side plate of 10 ft. 4 in., giving a cubic capacity of 3,836 cu. ft. This unusually large capacity is obtained by making the inside height 4 in. higher than in most automobile cars recently built. The car has a light weight of 52,200 lb., which includes the cast-steel underframe, weighing about 11,400 lb., and the automobile-loading device weighing approximately 3,200 lb. It is interesting to note, therefore, that this car, equipped with a cast-steel underframe and welded upper frame, weighs less than most other automobile cars of similar capacity, embodying conventional riveted-steel construction, especially if the weight of the loading device is taken into consideration. On the basis of light weight per cu. ft. of capacity, the comparison is especially favorable to the K. C. S. car, which has a light weight of only 13.6 lb. per cu. ft. of capacity.



Car temporarily removed from trucks in the wood shed for application of the floor, wood sheathing, automobile loading device, etc.

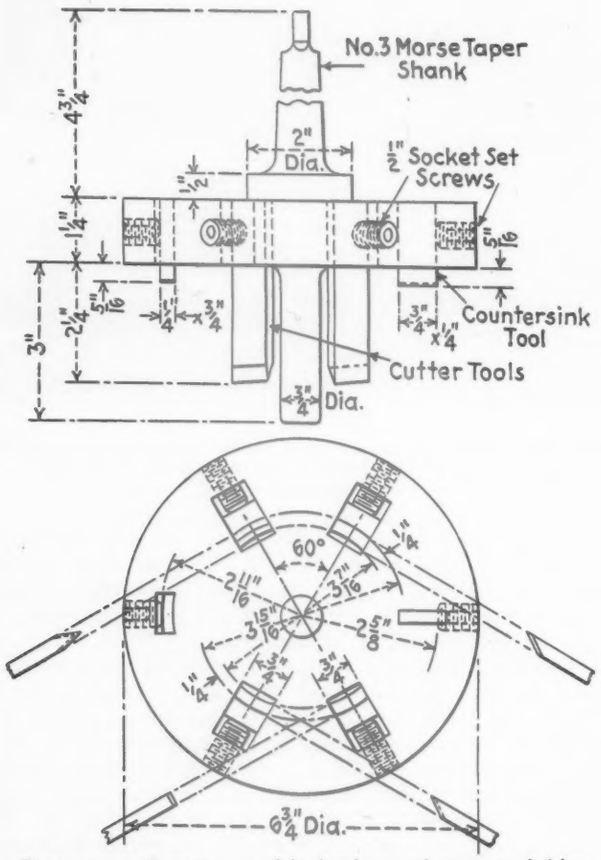
The underframe and superstructure of the car have been designed to withstand the stresses imposed by a 50-ton load, but due to the fact that the cars are expected to be kept primarily in automobile-carrying service, 40-ton capacity trucks are installed as being amply sufficient for this loading and for almost all other commodities with which box cars are being loaded at the present time. The car can be readily converted to 50-ton capacity if subsequently desired, however, by the application of 50-ton trucks and without any other changes being necessary. The cast-steel trucks installed are of the National, Type-B design, with a wheel base of 5 ft. 6 in., 5-in. by 9-in. journals, and Griffin 33-in. chilled-iron car wheels. Single-roller rocker-type side bearings, supplied by the Wine Railway Appliance Company, are installed. The air-brake equipment is of the new AB-type, furnished by Westinghouse Air Brake Company.

The cast-steel underframe, which greatly simplifies the construction of the car, is a one-piece steel casting with

Car completed, painted and stencilled ready for service

Interior view showing loader in raised position against asphaltum and sawdust painted steel roof

Plan, elevation and cross sections of the K. C. S. 40-ton cast-steel underframe all-welded automobile box car



Rotary wood cutter used in boring and countersinking holes for the loader wells

all cross ties, cross bearers, bolsters, end sills, side sills, center plates, striking castings and A. R. A. standard draft pockets and front and rear draft-gear stops cast integral. The center sills and bolster members are of box-section construction and the side and end sills and cross ties are of channel-section construction. The outside surface of the side sills is machine-finished to facilitate application of the posts and braces and the door track brackets. The side sills are 7 in. deep except under doors where they are 10 in. deep to give additional strength at the doorways, and this part of the casting has outward projecting flanges to support the ends of the deck boards at the doorways. The use of this one-piece cast-steel underframe eliminates 1,263 parts, including rivets; and the use of fusion-welding in the superstructure eliminates 1,915 additional parts, including rivets; or a total of 3,178 less parts than in the conventional car.

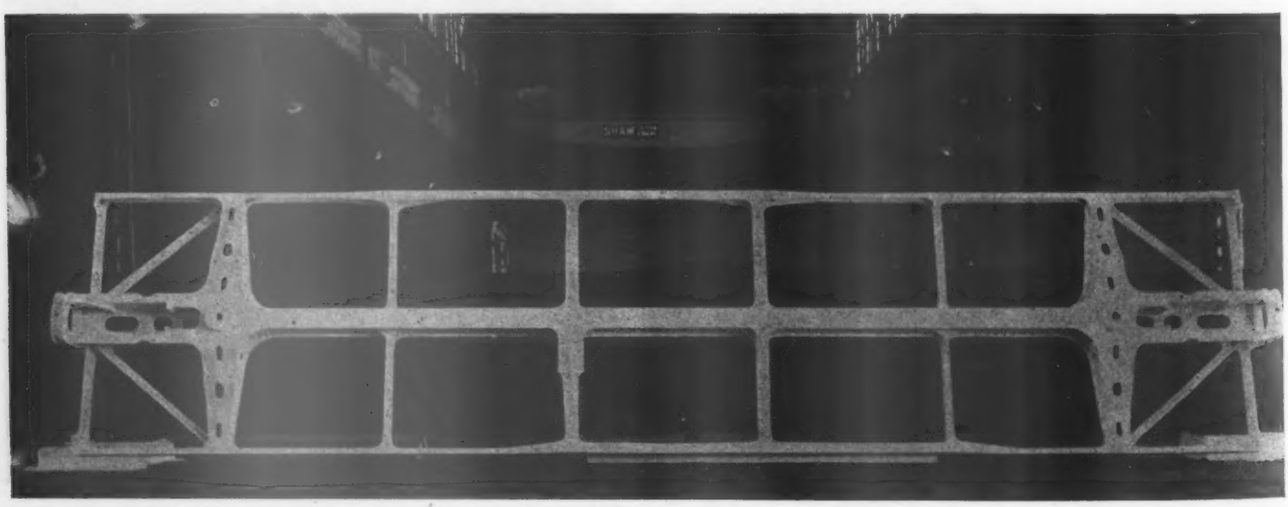
The side framing of the car is in the form of a Howe truss, the vertical and diagonal members consisting of structural Z-section posts and braces and the top horizontal member consisting of a special W-section side plate reinforced by a suitable ¼-in. by 17-in. steel plate, extending downward and cut away to give the required clear door opening. The bottom cord of the truss is formed by the underframe side sill, to which the posts and braces are securely electric welded. The corners of the side framing are strengthened by end diagonals.

The roof is of the solid-steel type, self-supporting and designed to accommodate the automobile-loading device. The corrugated doors, as mentioned, are of the bottom-supported type, with door openings 12 ft. 1 in. wide in the clear and staggered to give a 6-ft. clear opening across the car. Door-post corners are rounded to provide additional opening. The flooring consists of 1-¾-in. by 5-¼-in. face shiplap decking, supported upon the center-sill and side-sill flanges and upon intermediate supports composed of structural Z-section stringers.

The new K. C. S. automobile box car has been subjected to extensive deflection tests under various load conditions with unusually satisfactory results. The underframe deflections, as measured by means of gage wires, were kept within pre-determined limits and no permanent set developed. Impact tests were conducted at speeds up to 18 m. p. h. without damage to the underframe or any welded seams in the superstructure. The favorable performance of the car under these severe test conditions apparently give promise of long car life and freedom from maintenance expenses.

General Dimensions of K. C. S. Automobile Box Car

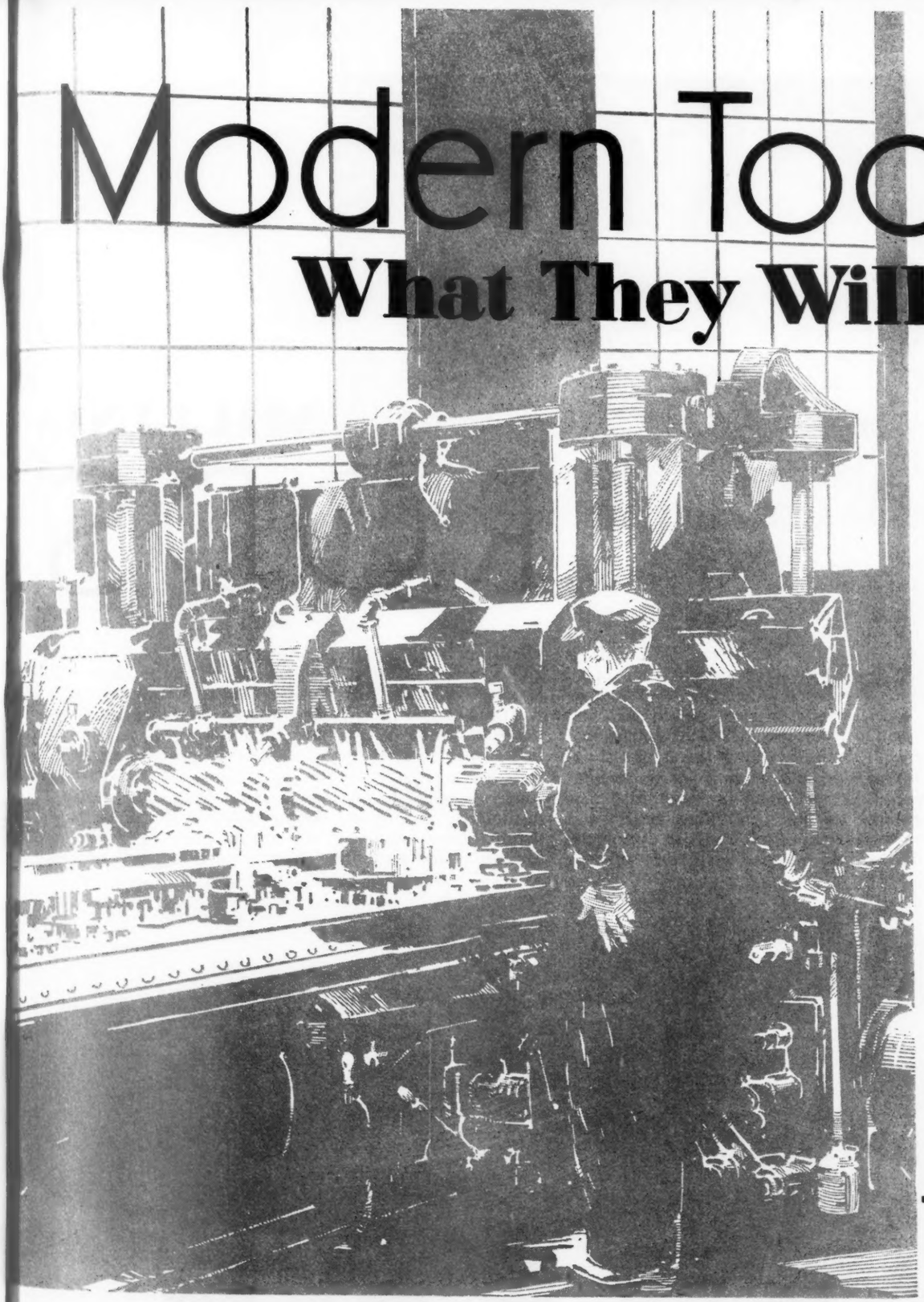
Length inside	40 ft. 6 in.
Length over buffer castings	41 ft. 11 in.
Truck centers	30 ft. 11 in.
Width inside	9 ft. 2 in.
Width over all	10 ft. 8⅞ in.
Height inside at side plate	10 ft. 4 in.
Height inside at center to panels in roof for about 50 per cent of the length of the roof to provide clearance for automobile radiator caps	11 ft. 0 in.
Height over running board	14 ft. 10⅜ in.
Width of side door opening (in clear)	12 ft. 1 in.
Wheel base of truck	5 ft. 6 in.
Size of journals	5 in. by 9 in.
Diameter of wheels	33 in.
Capacity of car in cubic feet	3,836
Weight of cast-steel underframe	11,400 lb.
Weight of automobile loading device	3,200 lb.
Light weight of car fully equipped	52,200 lb.
Nominal load-carrying capacity	80,000 lb.
Load limit	83,800 lb.



Commonwealth cast-steel underframe in the crane-equipped car shop

Modern Tools

What They Will Do



Progress in machine tool design in recent years has resulted in the production of machines which are capable of doing a much better job in considerably less time than is possible on obsolete tools. In the articles appearing on pages 186 and 190 examples of nine of the most important machine shop jobs are presented with time studies showing what a modern machine will do. A comparison of these with your present operation will enable you to determine what a modern tool can do for you.

MILLING RODS

MACHINING locomotive main and side rods is one of the most important operations involved in locomotive repair work. The average shop turning out from 20 to 40 classified repairs a month will find it necessary to machine from 100 to 200 new main and side rods annually. Practically all of the larger shops have been machining side and main rods on milling machines for several years, but it is recognized that developments in milling machines, in milling cutters and tooling equipment have been of such a nature during the past few years that it is now possible to perform this important machining operation on modern milling machines in considerably less time than on the older machines. A great many shops are still equipped with what may be termed obsolete designs of milling machines, many of which do not have sufficient width of table to mill two or more of many of the present-day designs of locomotive rods at one setting. Neither are these machines designed to take the heavy milling cuts required in finishing the present design and size of rod, nor are the machines equipped with quick clamping universal fixtures. Modern milling machines are required to feed

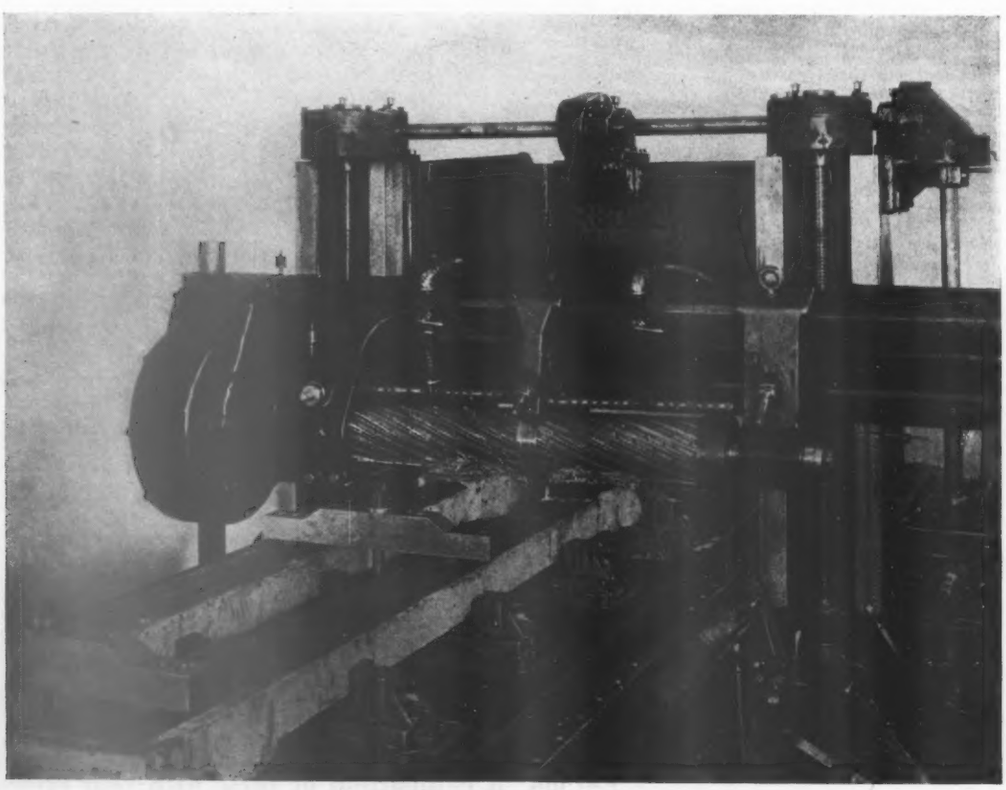


Fig. 1—At the first setting the ends of two rods are finished

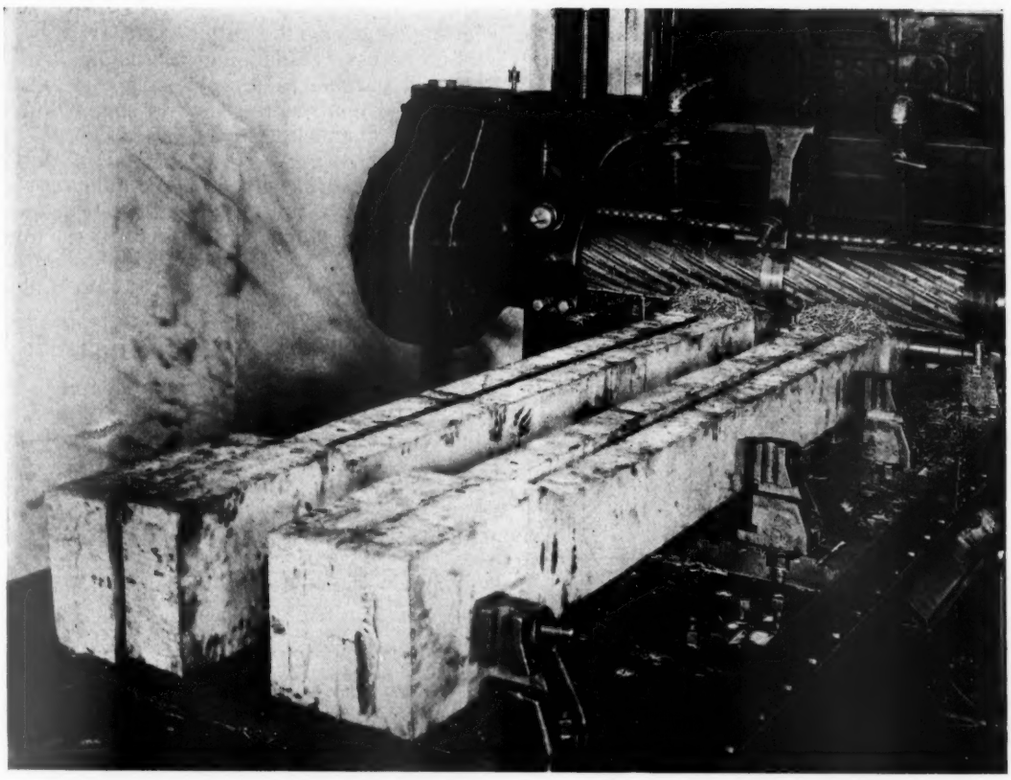


Fig. 2—Slab milling the edges of four main rods at one operation

at a rate of 5½ in. per min., whereas most of the older design machines are capable of feeding at not much over 1 in. per min. on channel milling and 2½ in. per min. on slabbing.

As an example of what can be done on a modern machine with modern tooling equipment detail information is presented giving a comparison of the time involved in the milling operations on carbon vanadium main and side rods on an old machine and on one of

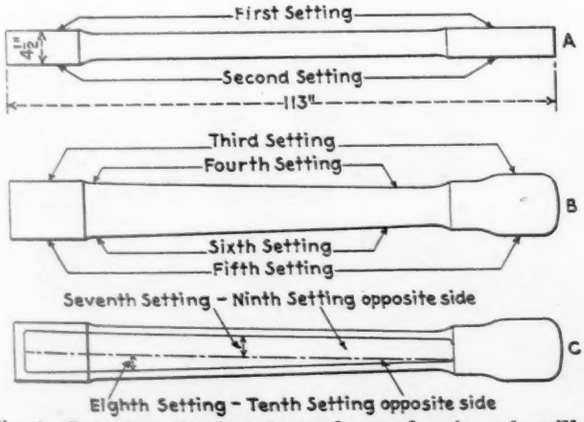


Fig. 3—Drawing showing the surfaces of main rods milled at the several settings

the most modern machines available for this class of work. The machine used as the basis for this study is an Ingersoll 54-in. by 30-in. by 16-ft., 75-hp. spindle milling machine equipped with Ingersoll fixtures and cutters.

Milling Main Rods

The main rods to be milled are of the conventional strap type, of which many are in service. The overall length of the rod is 113 in. and the time required on one of the old type milling machines to finish this rod, as far as the slabbing and channeling operations are concerned, was 27 hr., floor to floor, as compared with 11.75 hr. on the modern machine, a direct saving in time of 15.25 hr. for one pair of main rods of the type shown. The operations involved in machining these rods on the modern machine include ten separate settings for each pair of rods and the details concerning set-up and milling time are as follows.

Thirty minutes are required for mounting two 9-in. diameter by 24-in. cutters on the arbor of the machine for the first pair of rods and two hours are required to set and clamp two rods for the first and second settings on the machine which involve, respectively, the milling of the top and bottom flat faces of the two rods. This operation is shown in Fig. 1. The actual milling time for the first and second setting is 1.5 hr. for the two

Table I—Milling Operations on Main Rods

Setting no.	Description of operation	Set-up time (per pair of rods) Hr.	Set-up time (per pair of rods) Min.	Milling time (per pair of rods) Hr.	Milling time (per pair of rods) Min.
..	Mounting cutters on arbor for first pair of rods	..	30	..	..
1	Slab milling one side of two rods	1	..	..	45
2	Slab milling other side—two rods	1	..	..	45
3	Slab mill top edges of rod —ends two rods*	1	30	..	45
4	Mill top edges of rod body —two rods*				
5	Mill bottom edges of rod ends—two rods*				
6	Mill bottom edges of rod body—two rods*				
..	Mounting channeling cutters on arbor	..	30	..	..
7	Straight Channel cut	..	30	..	45
8	Taper channel cut—one side, two rods	..	30	..	45
9	Straight channel cut other side—two rods	..	30	..	45
10	Taper channel cut other side —two rods	..	30	..	45
	Total	6	30	5	25

* The time shown for two rods is based upon the assumption that four rods are milled at one operation. Four rods require 1 hr. 30 min. to mill or 45 min. per pair of rods.

rods. The third setting involves the milling of the top edges of both ends of the rod and four rods can be set up on the machine at one time. This operation is shown in Fig. 2. The fourth setting takes care of the milling of the top tapered edge of the body of the rod and the fifth and sixth settings, respectively, involve the milling of similar surfaces on the bottom edges of the four rods. Three hours are required to set up and clamp the four rods for the third, fourth, fifth and sixth

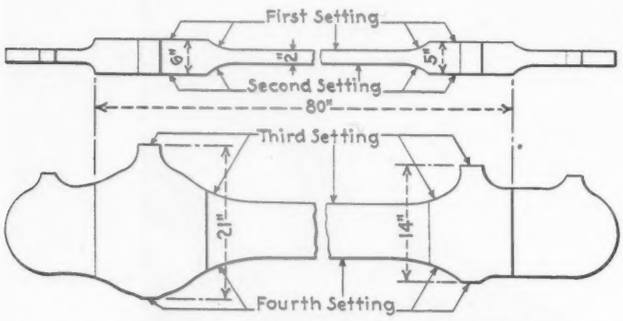


Fig. 4—Four settings are required to finish side rods

settings mentioned, or an average of 1.5 hr. per pair of rods. The actual milling time for the four settings mentioned is a total of 1.5 hr. for the four rods, or .75 hr. per pair of rods.

After these operations are completed the next step is to channel the rods and the machine is set up to mill the channels on two rods at one time. A total of 30 min. is again required for mounting two 10-in. diameter by 3½-in. staggered tooth cutters on the arbor of the machine for the first pair of rods on which this operation is performed. Two settings are required to mill the channels on each side of each rod. The seventh setting in the complete rod milling operation is that in which a channel cut is taken down through the rod parallel to one outer edge. This is shown in Fig. 5. The rods are then moved in the fixtures for the eighth setting in which the cutters take out the remaining material necessary to complete the opposite sides of the channel parallel to the opposite edge of the rod. The ninth and tenth settings of the channeling operation involve the channeling of the other side of each rod. This is shown in Fig. 3 (c). A total of two hours is required for setting up and clamping two rods for the seventh, eighth, ninth and tenth settings, and the actual milling time on two rods for these four settings is three hours. . A summary of the operations on main rods, together with the detail set-up and milling time, is shown in Table I.

Milling Side Rods

The milling of the side rods shown in Fig. 4 on the modern type of rod milling machine illustrated represents four operations involving a total floor-to-floor time for one pair of intermediate side rods of 4.5 hr. This time is one half that required to machine the same rods on an older type machine of the same general type, representing a saving in time per pair of rods of 4.5 hr. The milling work on these rods requires four settings. Preliminary to the actual milling operations 30 min. are required to mount two 9-in. diameter by 24-in. helical inserted tooth cutters on the arbor of the machine and 1.5 hr. are required to set up and clamp two rods in the fixtures; 45 min. setting time for the first setting in which the flat surfaces of both ends and the body of one side of the two rods is machined, and 45 min. more for turning rods over in the fixtures and clamping for mill-

Table II—Milling Operations on Side Rods

Setting no.	Description of operation	Set-up time (per pair of rods) Hr.	Set-up time (per pair of rods) Min.	Milling time (per pair of rods) Hr.	Milling time (per pair of rods) Min.
..	Mount two cutters on arbor..	..	30	..	..
1	Slab mill one side of two rods.	..	45	..	30
2	Slab mill other side of two rods.	..	45	..	30
3	Slab mill top edge of two rods*.	..	30	..	15
4	Slab mill bottom edge of two rods*	..	30	..	15
	Total	3	00	1	30

* The time shown for two rods is based upon the assumption that four rods are milled at one operation. Four rods require one hour to mill or a total of 30 min. per pair of rods.

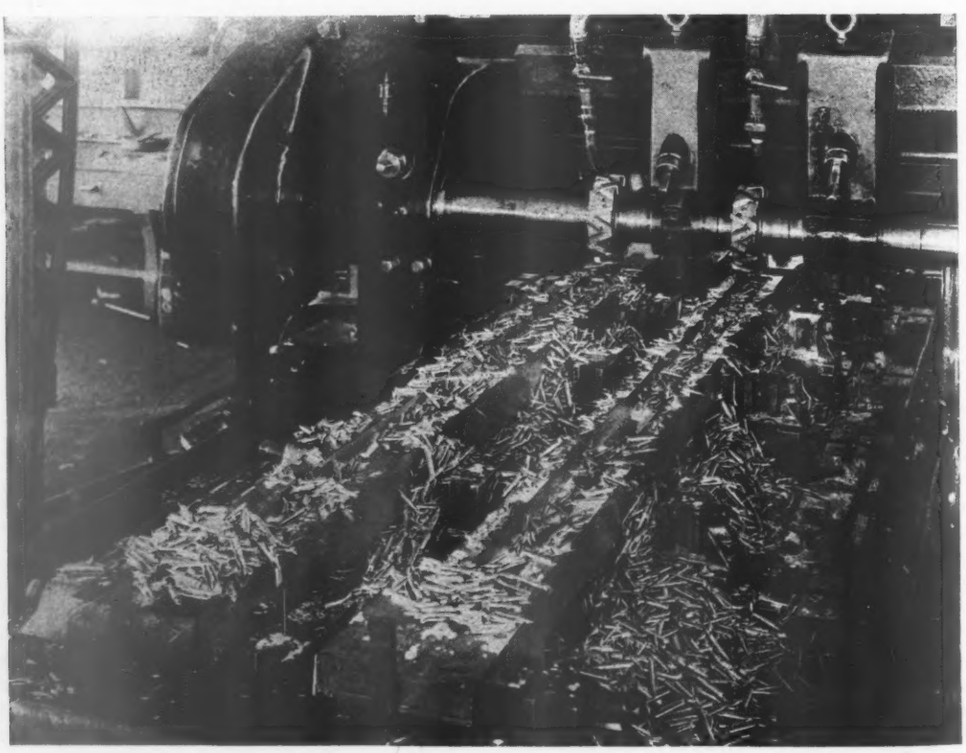


Fig. 5—Two passes of the channeling cutters are necessary to mill the tapered channels on each side of the main rods

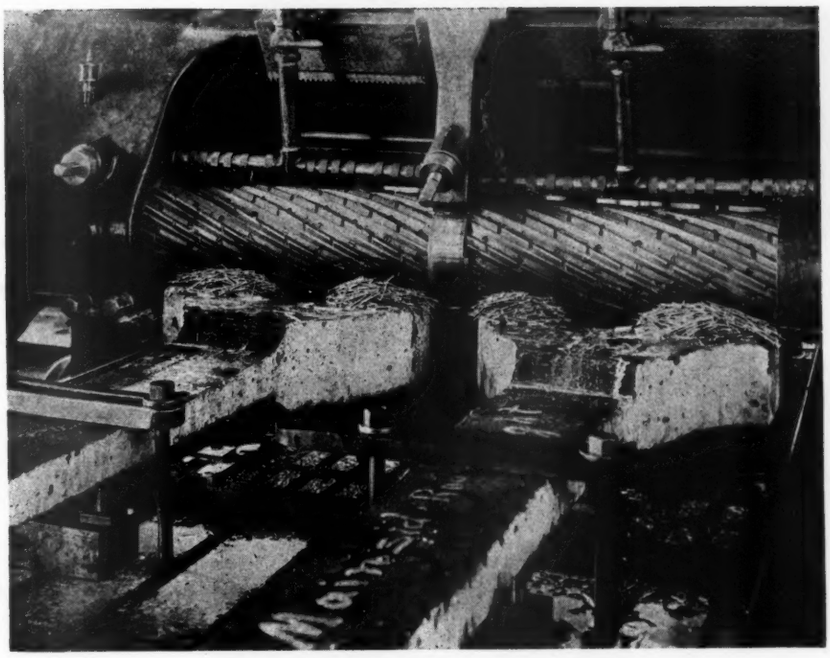


Fig. 6—Side rods are finished in four settings on the machine. The first, shown here, finishes the flat sides of the rods at one operation, using two cutters

ing the flat surfaces of the other sides of the rods. The actual milling time for both sides of these rods is 60 min. Fig. 6 shows the operation on the flat sides of the rods. Having completed the machining of the flat surfaces of the rods, the milling of the edges of the rods is next performed. In this operation as many as eight rods may be set up on the table of the machine at one time. One hour is required for setting up and clamping four rods in the fixtures (30 min. for two rods) for the third setting at which the top edges are milled. The actual milling time at the third setting is 15 min. per pair of rods. After the completion of the work at the third setting the rods are turned over in the fixtures and clamped for the milling of the other edge of the four rods. This is the fourth and final setting. One hour setting-up time is required for four rods on the fourth setting (30 min. for two rods) and 15 min. are required for each pair of rods for milling the other edges of the rods. A summary of the operations, together with the details of the set-up and milling time, is given in Table II.

As previously mentioned, the principal reasons why a modern design of rod milling machine is able to perform milling operations such as these is that the machine itself has a capacity not only to mill more rods at one time than is possible with the older machines, but also is equipped with special fixtures and cutters that make it possible to reduce the set-up time and to speed up the actual feeding of the cutters into the work at a rate not possible on the older machines.

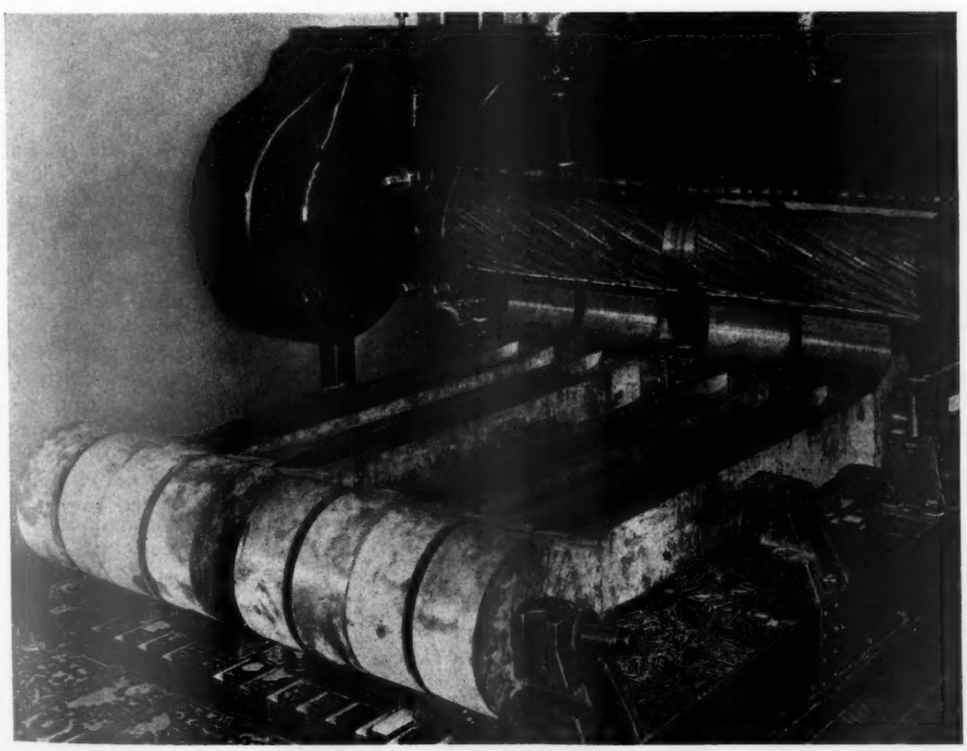
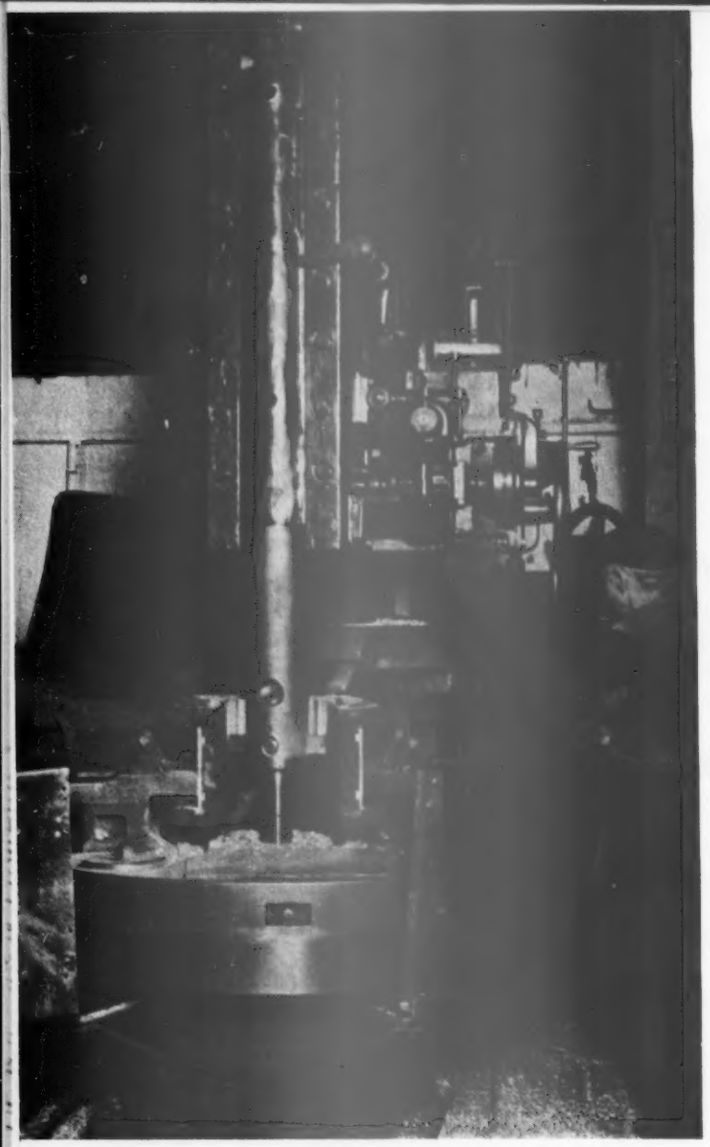


Fig. 7—The table width and fixtures of a modern milling machine will accommodate as many as eight side rods at one time



Eight difficult jobs of

BORING AND TURNING

THE machine operations required on locomotive parts normally performed on a vertical turret lathe or vertical boring mill cover a range of parts from small rod bushings to the largest driving-wheel centers and tires and involve machining time varying from 10 to 15 min. per part up to as much as 10 to 15 hrs. The wide variation in the machining time on many parts finished on machines of these types as performed on some of the older machines which have been in service from ten to thirty years, compared with the minimum time in which it is possible to finish these parts on the most modern machines, serves to emphasize the savings which can be made in many instances on the more modern machines. Some of the typical machine-shop operations performed almost every day have been selected as a basis of presenting time studies. Such jobs as trailer-wheel centers, driving-wheel centers, driving-wheel tires, driving boxes, crossheads, eccentric cranks, cylinder heads and floating bushings are excellent examples. An average shop in the course of a year finds it necessary to machine as many as 100 driving and trailer-wheel centers, from 1,500 to 2,000 driving boxes, 100 crossheads, 200 eccentric cranks, 100 cylinder heads, and as many as 1,000 to 1,500 rod brasses.

Time studies on eight typical machine-shop jobs are presented in this article, together with drawings showing the operations, set-ups and tooling arrangements on many of these jobs. The data on the eight types mentioned are separated into two groups. The first group, dealing with trailer-wheel centers, tires and driving boxes, shows the time in which these jobs can be performed on a modern Sellers boring mill, and the second group shows the time and set-up involved in performing four typical jobs on a Bullard vertical turret lathe with special tooling equipment.

Group 1

Wheels and Boxes

The work involved in finishing a 44-in. trailer-wheel center on an old machine requires from three to six hours in many shops. It is possible on a modern machine to finish one of these wheel centers in two settings of the work in less than two hours. The first operation after setting up the work consists of rough turning the circumference of the wheel center and rough facing the hub. Two cuts at a table speed of 6 r.p.m. with ⅛ in. feed are used on this operation. The next step is to rough bore and then to finish bore the wheel hub for the axle fit. The last operation on the first setting involves the finishing cut on the circumference of the wheel and the finishing of the hub of the wheel. The time required for the first setting is approximately 1 hr. 30 min. The wheel center is then turned over for the second setting and the roughing and finishing cuts taken on the opposite side of the wheel hub. The time required for the work on the second setting, including setting up, machining and removing work from the table, is approximately 25 min., making a total time for the complete operation of 1 hr. 55 min.

A 56-in. cast steel driving-wheel center can be machined on a modern machine in less than six hours. This is also a job requiring two settings. At the first

setting the first operation is to rough-turn the circumference and one side of the rim and hub, taking two roughing cuts over each of these surfaces. On this operation table speeds of 4½ and 12 r.p.m. are used for the ⅛-in. feed. The next operation is to rough bore the hub for the axle fit. The bore on the particular wheel center in question is 12 in. in diameter by 9 in. long. Two cuts are taken through the bore for the roughing operation at a table speed of 16 r.p.m., using 1/16-in. feed. The next step is to finish the bore taking two finishing cuts at a table speed of 9 r.p.m. and ⅛-in. feed. The final operation at the first setting is to take two finishing cuts over the circumference of the wheel at a table speed of 2 r.p.m. and to finish the side of the rim and the hub of the wheel. A ¼-in. feed is used on this operation and a table speed of 6 r.p.m. is used when finishing the hub. The wheel center is then turned over and clamped on the table and the opposite side of the rim and hub is rough turned and faced and a final finishing cut taken. Table speeds of 4½ and 7 r.p.m., respectively, and ¼-in. feed are used. The final operation is to rough face and turn the counterbore and to finish the counterbore. The total machining time, including setting up the work, setting the tools, the actual machining, and removing the work from the table, is 5 hr. 50 min.

In finishing a 70-in. cast-steel driving-wheel center the operations are similar, although involving larger surfaces, and the work can be completed on a modern machine in a total of 6 hr. 30 min.

Another job of this type of machine is the boring, for example, of 70-in. driving-wheel tires, in which the tires are set up in the chuck, rough bored, using two heads, and finally finished bored and the square shoulder cut in the tire. This job can be performed on a modern machine, including setting-up and removing the work, setting tools and machining, in 54 min.

Boring and Facing Driving Boxes

This is a job performed in the average shop every day, and the volume of work is usually sufficient to warrant the installation of a special machine with fixtures and tools especially adapted for the boring of crown brasses and the facing of hub liners. Depending upon the size of the driving box, the average time required on the older machines will vary from 35 to 60 min., whereas on a modern machine with the proper fixtures and tooling equipment this work can be performed in from 15 to 30 min., depending upon the box size. As an example, 11-in. by 14-in. boxes can be bored and faced in an average of 21 min., floor to floor; 13-in. by 14-in. boxes, in 26 min., floor to floor, and 11-in. by 20-in. main boxes with bronze liners, in an average of 30½ min., floor to floor.

Group 2

Finishing Floating Rod Bushings

Figs. 1 and 2 show the arrangement of tools and the manner of performing the several operations involved in finishing a bronze inner floating rod bushing on a 36-in. vertical turret lathe equipped with a three-jaw combination chuck and special tooling equipment. The

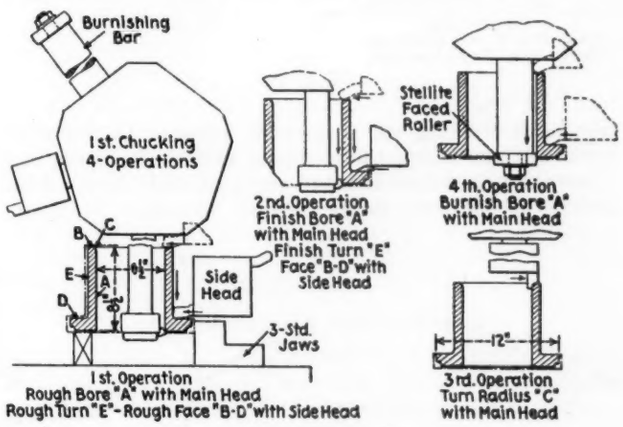

Burnishing Bar
1st. Chucking 4-Operations
Stellite Faced Roller
2nd. Operation Finish Bore "A" with Main Head
Finish Turn "E" Face "B-D" with Side Head
4th. Operation Burnish Bore "A" with Main Head
Side Head
3-Std. Jaws
12"
1st. Operation Rough Bore "A" with Main Head Rough Turn "E" - Rough Face "B-D" with Side Head
3rd. Operation Turn Radius "C" with Main Head

Fig. 1

Finishing a crosshead is one of the most difficult machine shop jobs

entire machining job is performed in two chuckings at cutting speeds varying from 80 ft. per min. on roughing cuts to 190 ft. per min. on finishing cuts. After setting up the bushings in the chuck the first operation is to take a roughing cut down through the bushing on surface *A* with the main head. While this is being done the side head is facing off surface *B*, followed by the turning of surface *E* and the facing of surface *D*. Roughing cutters are then removed and replaced with the finishing cutters preparatory to the second operation which involves the finishing cut on the surfaces above mentioned.

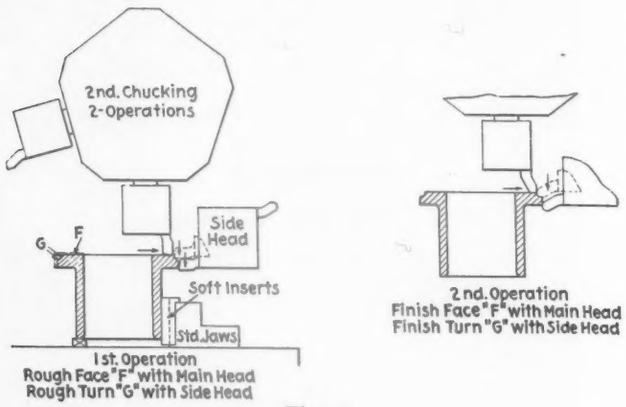


Fig. 2

On the third operation the radius *C* on the inside of the bushing is finished. After this is completed the fourth operation consists of burnishing the bore of the bushing (surface *A*) with a tool in the main head equipped with a Stellite-faced roller.

The four operations performed at the first chucking consumed 10 min. of elapsed time, which includes setting up the bushing in the chuck, changing cutters, indexing the side head and turret and removing the work from the table. After this has been done, the second chucking is set up and the first operation consists of a roughing cut to face off surface *F* at the same time that the radius *G* is turned. The second operation consists of the finishing cuts with the main and side heads simultaneously on surfaces *F* and *G*.

The total elapsed time involved in the second chucking from floor to floor is 5 min. The total time for completely finishing this bushing is 15 min.

Machining Eccentric Cranks

This job is performed on a direct-drive high-bed 54-in. vertical turret lathe equipped with four-jaw independent chuck and cutting lubricant system. The eccentric crank finished is a steel forging and before the crank comes to the vertical turret lathe for the finishing operations described here the surface marked *X* has been finished and the slot *Y* milled and wedged and dummy bolts and nuts are inserted and drawn up in place.

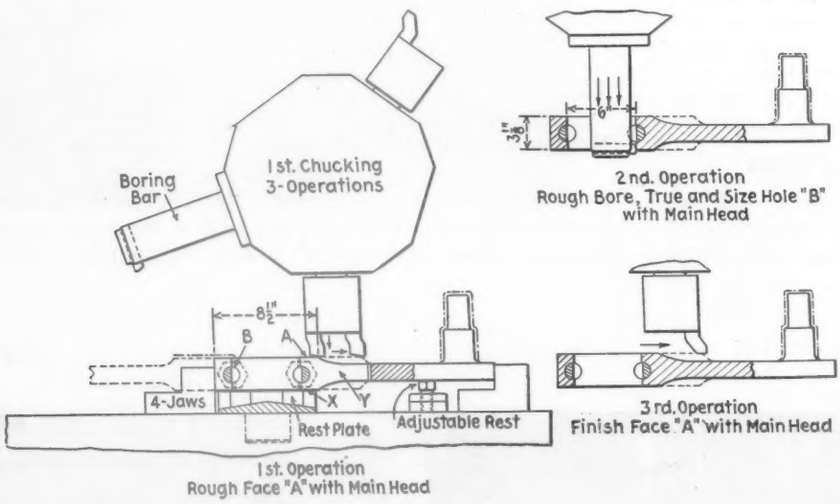
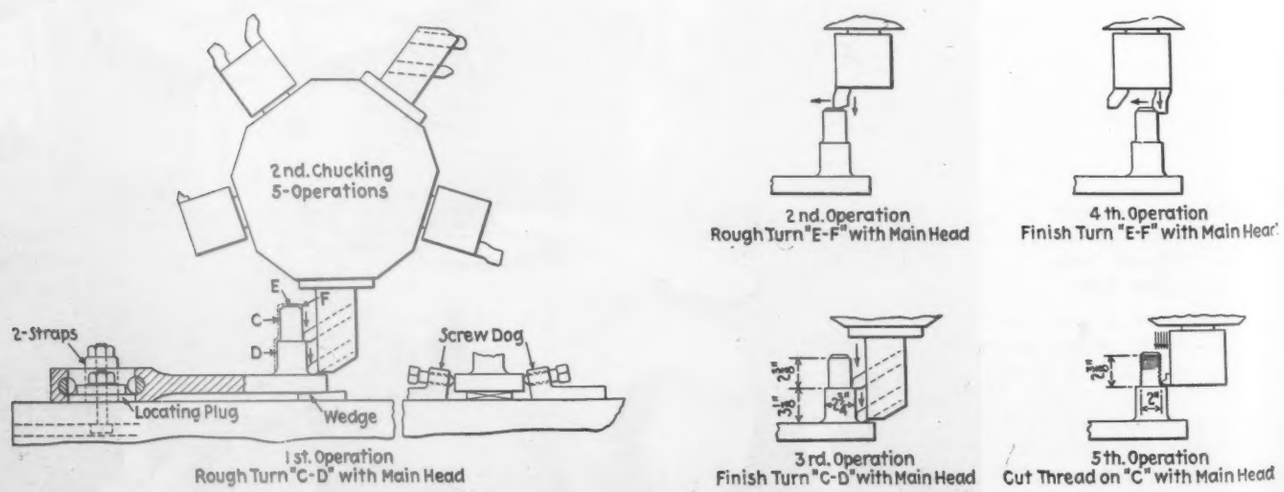


Fig. 3 is shown at the left and Fig. 4 below



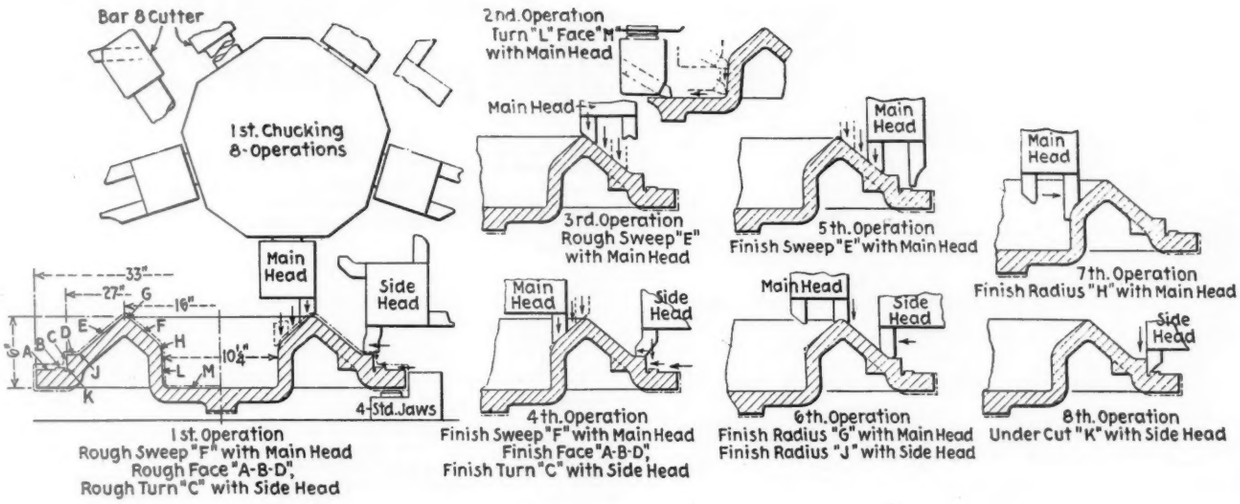


Fig. 5

The cutting speeds used vary from 32 to 73 ft. per min. on the roughing operations and from 31 to 93 ft. per min. on the finishing operations. The complete machining of this crank was performed in two chuckings,

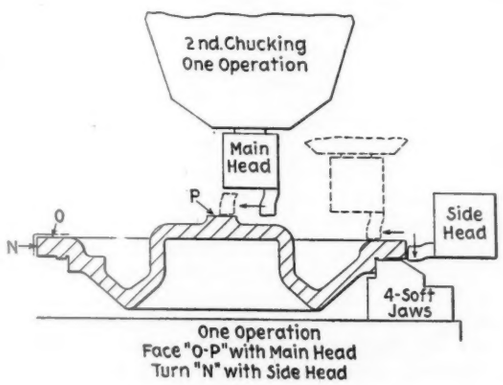


Fig. 6

the first consisting of three operations and the second of five operations, in a total floor-to-floor time of 34 min.

On the first chucking the work is set up in the four-jaw chuck and the first operation consists of a roughing cut over surface *A*. This is shown in Fig. 3. The second operation consists of a roughing cut to bore the hole for the crank pin (surface *B*). This bore is then trued and finished with successive cuts. The third operation on the first chucking consists of finishing the surface *A* with a tool in the main head. The total time from start to finish of the three operations involved in the first chucking is 18 min.

The eccentric crank is then reset for the second chucking by locating on the table with the eccentric-crank pin at the center line of the table, and the work is located over a plug at the outer circumference of the table. This is shown at the lower left-hand corner of Fig. 4. The other end of the eccentric crank at the center of the table is held in place by two screw dogs.

The first operation of the second chucking consists of roughing simultaneously the surfaces *C* and *D* of the pin with the main head, and the second operation consists of a roughing cut on surfaces *E* and *F*. The third and fourth operations consist, respectively, of the finishing cuts on surfaces *C*, *D*, *E* and *F*. The fifth and final operation of the second chucking is the threading of the pin for the eccentric crank nut, which involves eight passes of the threading tool over the length of the threads.

The time involved in the second chucking, including setting-up and removing work, is 16 min., making a total for the complete finishing of this style eccentric crank of 34 min., floor to floor.

Machining a Cylinder Head

It is possible to finish completely a 33-in. O.D. cast-iron cylinder head on a 54-in. vertical turret lathe equipped with a four-jaw independent chuck in a floor-to-floor time of 1 hr. 25 min. The cutting speeds used in the several operations described here in detail vary from 31 ft. per min. on a roughing cut to 77 ft. per min. on certain finishing cuts. The entire job can be performed in two chuckings, the first of which consists of eight operations, and the second of one operation. Fig. 5 shows the various tooling arrangements for the eight operations involved in the first chucking, and Fig. 6 shows the same set-up for the second chucking. The first operation of the first chucking consists of rough turning of surfaces *A*, *B*, *C* and *D*, using the side head of the machine, while at the same time a roughing cut is taken over surfaces *F* with the main head. The second operation consists of the boring of surface *L* and the facing of surface *M*. On the third operation the outer angle of the head is rough turned. The fourth and fifth operations consist of the finishing of surfaces *A*, *B*, *C*, *D*, *E* and *F*, with the main and side heads of the machine working simultaneously. On the sixth operation surface *G* is finished with the main head at the same time that the surface *J* is finished with the side head. On the seventh operation surface *H* is finished with one of the tools on the main head. The turret is then indexed back to the position of the first operation and the eighth operation consists of cutting groove *K* with a tool in the side head. The time for setting up, indexing and performing all of the eight operations of the first chucking is 1 hr.

On the second chucking the work is set up in four soft jaws gripping the cylinder head on the finished surface *C*, and the outer diameter *N* is rough turned with the side-head tool at the same time that a roughing cut is taken over the surface *O* with the tool in the main head. The last step in the second chucking is to rough face the boss *P* on the outside of the head. The time

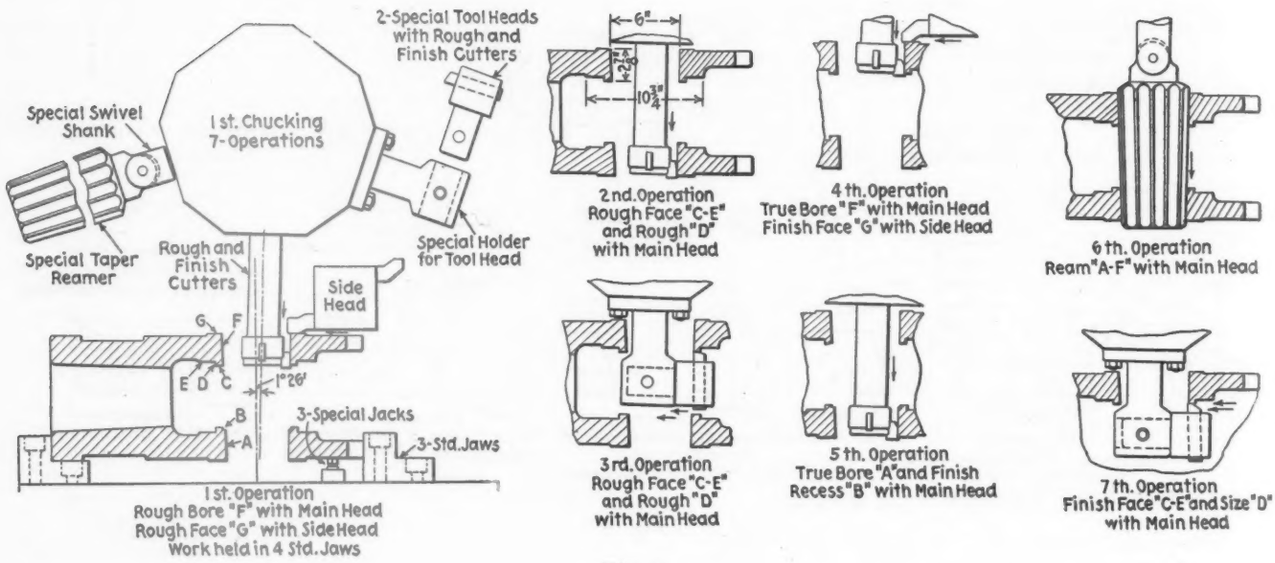

2-Special Tool Heads with Rough and Finish Cutters
Special Swivel Shank
1 st. Chucking 7-Operations
Special Taper Reamer
Rough and Finish Cutters
Special Holder for Tool Head
Side Head
G F
E D C
1°26'
B
A
3-Special Jacks
3-Std. Jaws
1 st. Operation
Rough Bore "F" with Main Head
Rough Face "G" with Side Head
Work held in 4 Std. Jaws
6"
10 3/4"
2 nd. Operation
Rough Face "C-E" and Rough "D" with Main Head
4 th. Operation
True Bore "F" with Main Head
Finish Face "G" with Side Head
6 th. Operation
Ream "A-F" with Main Head
3 rd. Operation
Rough Face "C-E" and Rough "D" with Main Head
5 th. Operation
True Bore "A" and Finish Recess "B" with Main Head
7 th. Operation
Finish Face "C-E" and Size "D" with Main Head

Fig 7

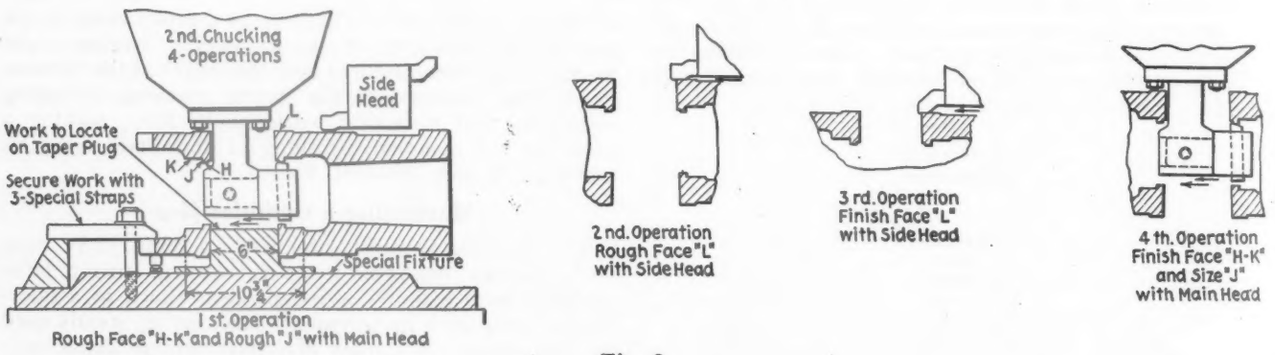

2 nd. Chucking 4-Operations
Side Head
L
Work to Locate on Taper Plug
K J H
Secure Work with 3-Special Straps
6"
Special Fixture
10 3/4"
1 st. Operation
Rough Face "H-K" and Rough "J" with Main Head
2 nd. Operation
Rough Face "L" with Side Head
3 rd. Operation
Finish Face "L" with Side Head
4 th. Operation
Finish Face "H-K" and Size "J" with Main Head

Fig. 8

required for setting up, performing the work and removing the cylinder head from the table on the second chucking is 25 min., making a total time for the complete finishing of the head 1 hr. 25 min.

Finishing an Alligator Type Crosshead

This is one of the difficult locomotive machine-shop jobs which requires, on many of the older machines performing one operation at a time, from four to ten hours to do the same work that can be done on a 42-in. vertical turret lathe equipped with a four-jaw independent chuck in 1 hr. 30 min., floor to floor. The crosshead in question is a steel casting and the cutting speeds vary from 23 to 57 ft. per min. The complete finishing of the crosshead is performed in three separate

(*Continued on page 198*)

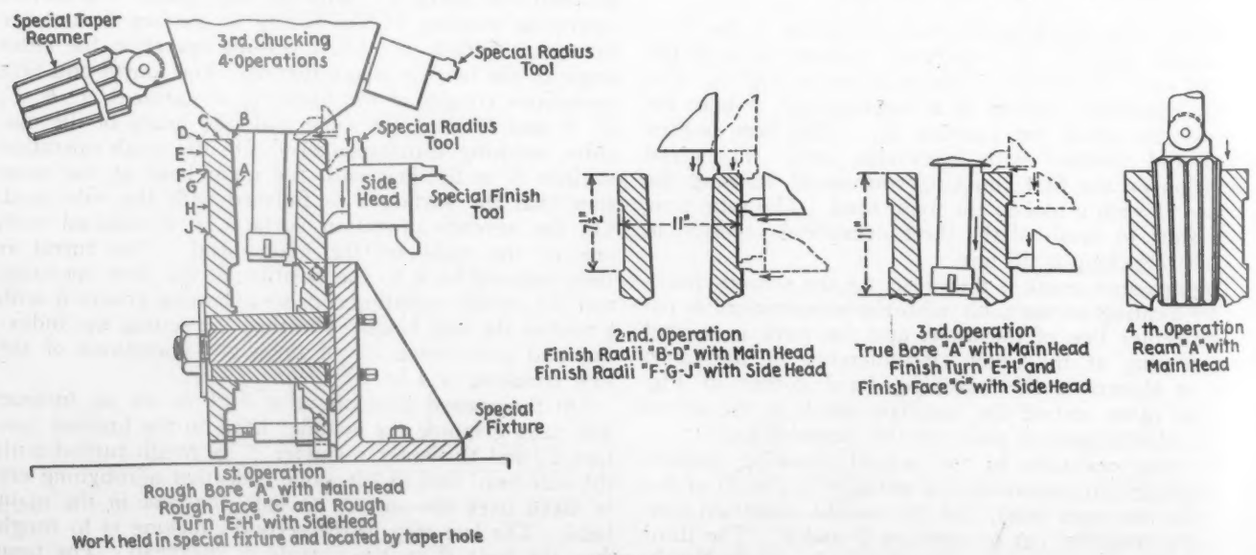


Fig. 9

Machine Tools And Shop Equipment

A chief executive emphasizes the need for better facilities and points out their value as shop operations increase

MANY railroads under normal conditions regularly budget each year a considerable amount of new machine-tool and shop equipment to replace older and obsolete facilities. Unfortunately, conditions have been such during the past few years that, except in a few instances, the railroads have had to keep almost entirely out of the market for such equipment. This is not surprising, particularly in view of the fact that the locomotive and car repair shops have been running with light forces and on short time, if indeed, they have not been shut down entirely for extended periods.

Will the Railroads Buy New Tools?

Will the railroads go into the market for new equipment of this kind in the near future? This question was propounded to the chief executive of a railroad which has maintained its shop and enginehouse equipment well above the average.

"It is purely a matter of finance," said the Chief Executive. "Our shops are being worked well below capacity and this will continue until there is reasonable assurance of a much larger traffic than we are now handling. There is no question but that we can improve the efficiency of shop operations by replacing some of the older machine tools and shop equipment. On the other hand, there are more pressing demands upon us for other kinds of expenditure. State regulation also, for instance, is forcing us to spend considerable money for grade crossing elimination, on which, incidentally, we will receive little if any financial return."

"Would it be advisable for you to purchase new tools and shop equipment at the present time, if you could obtain the money on reasonable terms, such, for instance, as extended by the government for the purchase of new cars and locomotives?"

Sees Improved Business In 1935

"Yes," replied the Chief Executive. "In my opinion business in 1935 will be such that we will be forced to operate our shops and enginehouses on a more normal basis, and new tools and equipment installed prior to that time will give a good account of themselves."

"If this is true," I suggested, "ought not steps to be taken promptly to insure the purchase of machine tools and shop equipment during the present year?"

"Yes," responded the Chief Executive. "If we could obtain money from the government for such purposes on reasonable terms, it would take so much time to consummate the financial arrangements; decide upon just what tools and equipment were most needed in the shops and enginehouses; secure bids; allot the orders; build, deliver and install the tools and equipment, that they would hardly be available for use much before the end of the present calendar year—possibly not far in advance of the time when they will really be very much needed.

Old Tools Should Be Replaced

"Is there much machine tool and shop equipment which can be replaced to advantage at this time?"

"Yes," said the Chief Executive. "In our own shops, which, as you know, have been kept reasonably up-to-date, we are suffering because of the lack of expenditure for machine tools and shop equipment during the past few years. There are several reasons for this. Our road, like many others, has been closing some of the smaller shop and repair points and has been attempting to concentrate repairs at a central point. You can readily understand that an increased amount of work of any one kind at a given shop may be sufficient to warrant the introduction of special machinery, which can be operated more on a production basis. Under such conditions one new special tool may replace several of the older tools, thus economizing in shop room and making it possible to arrange the machinery in such a way as to facilitate operations and cut down unit costs."

Expensive Tools Lie Idle

"The argument has been advanced," I said, "that new machine tools, specially adapted to the work, may have to lie idle a considerable part of the time. Can this be justified?"

"In many instances, yes," replied the Chief Executive. "It is conceivable that a special tool might be so expensive that the interest on the investment and depreciation would increase unit costs to an unreasonable point, and that under such conditions the use of the new machine tool could not be justified. On the other hand, most of the machine tools used in railroad shops do not come within this category and the increased cost of investment will not offset the savings in labor which may be made by the increased rate of production. Even if, because of idleness, the unit costs remain as great as they were before, the use of some of these machines may make it possible to cut down the amount of time that the locomotives and cars are held out of service. In addition to this they afford a reserve capacity that can be utilized to excellent advantage under peak-load conditions."

"This suggests, does it not," I said, "that each case must be considered by itself and on a scientific basis?"

"Quite true," said the Chief Executive, "and if I understand conditions correctly, the tendency has been more and more in that direction in recent years. The fact must not be lost sight of, also, that the engineering forces of the machine tool builders are in excellent position to assist in making studies of this sort."

Gas Rail Car Converted to Diesel Type

By T. H. Murphy*

Seaboard Air Line car shows fuel saving at the rate of $10,000 a year after installation of Diesel engine power plant

THE Seaboard Air Line recently replaced the gasoline engines in a rail car purchased in 1928 by a modern Diesel engine. Studies of the relative economies indicate savings sufficient to justify the use of this prime mover. One Diesel engine-generator set was purchased and installed in 1933 and operating data after 10,000 miles of service show that savings the first year on fuel alone will total over $10,000 and be well above preliminary estimates.

The Seaboard Air Line car No. 2013, operating between Savannah and Americus, Ga., was selected for the changeover. This car was purchased in 1928 and had operated over 600,000 miles in revenue service with satisfactory performance. The car body is divided into a 44-ft. 10-in. baggage compartment, a 15-ft. standard railway post office, and a 13-ft. 2-in. engine room. The car

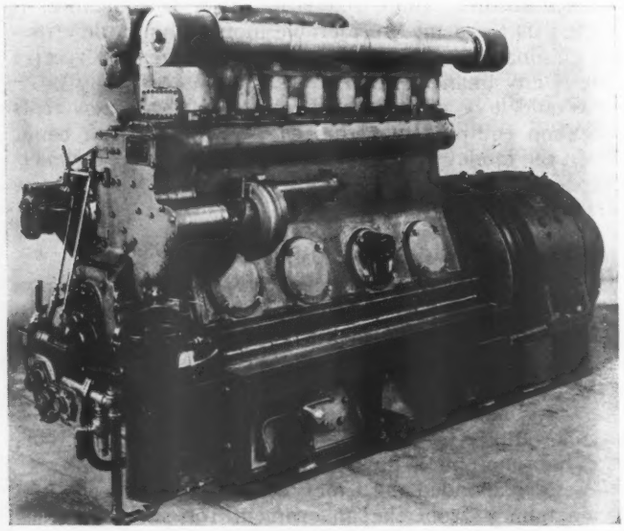
Engine room with Diesel power plant

was equipped with a gasoline engine of the six-cylinder type with 7½-in. bore and 9-in. stroke, and rated at 1,050 r.p.m. A direct connected generator supplied power to two traction motors and a small generator mounted on the shaft of the main machine furnished auxiliary power.

Conversion Apparatus

The gas-engine-generator set was replaced by a Westinghouse Diesel power plant rating 265 hp. at 900 r.p.m. The new unit fitted into the engine room without modification to obtain greater space at any point and the accessibility of parts is equal to that had before the conversion. The engine is a four-cylinder, four-cycle, solid-injection, light-weight Diesel type manufactured by the Westinghouse Electric and Manufacturing Company for both rail cars and locomotives. It has an oil governor and automatic timing that permit variable engine-speed control. Individual aluminum alloy cylinder heads with dual valves and renewable valve seats, aluminum pistons, and removable liners are features of the engine. Covers enclose completely the valve gear which is fully pressure lubricated. A low lubricating-oil-pressure trip and a protective overspeed flyball governor provide operating safety. The crankshaft is a solid forging with integral counterbalance weights and drives a dynamic balancer mounted in the crankcase. Torsional vibrations are absorbed by a damper mounted at the front of the engine.

The existing radiator cooling system was retained but this was supplemented by a lubricating-oil radiator mounted at the front of the car to obtain natural-draft



Diesel power plant used on car

ventilation. The fuel tanks were not changed but a gear-type motor-driven pump was mounted at the tanks to replace the vacuum system used with the gasoline. The fuel consumption was reduced over 50 per cent by the Diesel installation so that the cruising range of the car without refueling has been doubled.

Control

Very few modifications were made to the control. Electric engine starting by means of the generator and

* Railway Engineer, Westinghouse Elec. & Mfg. Company.

Seaboard Air Line rail motor car No. 2013 converted to Diesel type

battery, the controller for motor connections, a mechanical throttle, and a differential generator characteristic with variable engine-speed control were retained. New propulsion and auxiliary generators were necessary because of the difference in engine rated speeds and mounting requirements, but the differential characteristic is essentially the same except for an improvement that gives better engine power utilization.

The existing 32-volt, 16-cell battery was supplemented by 16 additional cells to provide a higher firing speed that is necessary with the Diesel engine. However, the feature of 32-volt control and lighting was retainel by

Table I—Service Data

Operation	Time Table Information Round trip daily between Savannah and Americus, Ga.	
Seaboard Airline train Nos.	13	14
Schedule time	6 hrs. 55 min.	7 hrs. 05 min.
Revenue miles	198.6	198.6
Schedule speed, m.p.h.	28.7	28.1
Non-revenue miles	2.75	2.75
	Comparative Data	
Type of Equipment	Diesel	Gas
Daily miles	402.7	402.7
Miles of comparative record	10,000	634,000
Gallons of fuel per day	139.5	288
Train miles per gallon	2.89	1.4
Fuel cost per gallon, cents	4.0	12.52
Fuel cost per train mile, cents	1.384	8.96
Annual miles (90 per cent Availability)	132,200	132,200
Annual fuel cost	$1,829.65	$11,845.12
Annual fuel saving	$10,015.47	
Miles per gallon of lubricating oil	94.5	92
Train weight, tons	101.45	93.0
Ton miles per gallon	293	130

automatic parallel connection of the two 16-cell battery sets for running and the provision of a series connection to give 64 volts for engine starting.

The auxiliary generator has been the sole source of power for both the motor and trailer batteries. Its voltage was sufficient for charging only when the engine was almost up to rated speed. A fairly high charging rate was necessary as the available charging time was only a small percentage of the total operating time due to the fact that the engine idled when the car was coasting or standing in stations. The Diesel engine is governed at a constant speed when idling and the propulsion generator maintains voltage of the proper magnitude for charging the battery. This permitted modifying the control so that, in addition to the charging from the auxiliary generator, the main generator charges the battery when the engine is idling. It is expected that this feature will give longer battery life due to the more uniform charging rate possible and will eliminate charging at terminals.

Operating Results

Numerous Diesel-electric rail cars have fuel consumptions in gallons per mile from one-half to one-third of that of gas-electric cars, and ton-miles per gallon two to three times greater. This lower volume consumption is due to the efficiency of the Diesel engine which is obtained by higher compression, and to the greater B.t.u. content of a gallon of fuel oil as compared with a gallon of gasoline. Many Diesel engines have a guaranteed fuel rate as low as 0.43 lb. of oil per brake horsepower per hour, and consumptions as low as 0.40 lb. are obtained. A gasoline engine will consume usually not less than 0.60 lb. per brake horsepower per hour at full load, and in actual average service is much higher generally because of a rapid decrease in efficiency at less than full rated load. The average weight per gallon of gasoline is only 6 lb. as compared with 7.5 lb. average for fuel oil. These figures indicate a volume consumption for the Diesel of 0.0575 gallons per brake horsepower per hour, and for the gasoline engine 0.10 gallons or about twice as much. Preliminary studies on the Seaboard were based on a 1 to 2 ratio.

The conversion has given an actual comparison in identical service. The fuel consumption ratio is less than 1 to 2 for the first 10,000 miles of Diesel operation compared to the previous gasoline performance and 2.26 to 1 is the ratio of ton-miles per gallon. It is expected

that more severe grades and frequent stops would produce ratios even more favorable to the Diesel. The lubricating oil consumption per mile is lower with the Diesel and this will contribute still further to the savings. Schedule performance according to reports is equal to that obtained with the gas-electric power plant.

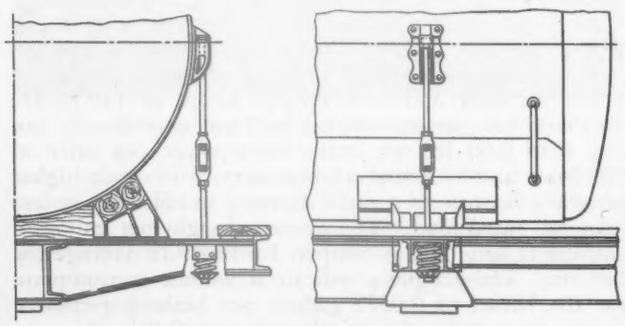
Tank-Car Stabilizer

AN improved method of securing the tanks of tank cars to the underframes has been developed by J. C. Sullivan, general superintendent, Gulf Refining Company, Pittsburgh, Pa. The object of the device is to eliminate the tank bands which have been heretofore used for this purpose. That the common tank bands have not been entirely satisfactory is quite generally

Tank car equipped with stabilizer

recognized—due to their tendency to loosen, causing the center anchorage rivets to shear, leakage at tank riveted seams, or bucking of the tank bottom plates.

On many tank cars the bands have been provided with turnbuckles as a convenient means of tightening them,



Sullivan tank car stabilizer

but in practice it has been found that bands do not stay tight. No provision having been made to compensate for variations in tank diameter due to expansion, a resulting high pressure is exerted against or near the top horizontal seam and leakage at the seam has resulted until the excess pressure becomes relieved by elongation of the bands.

The Sullivan tank stabilizer here illustrated is designed to eliminate leakage caused by too tight tank bands and the shifting of loose bands. As will be noted, a bracket is riveted to the side of the tank at the center line and a 1⅜-in. bolt provided with a turnbuckle connects this bracket to the body bolster of the underframe.

At the lower end a resilient spring is interposed between the spring seat attached to the bolster and the spring cap on the bottom end of the holding-down bolt or stay rod. The helical spring has a capacity of 44,000 lb., the desired tightness and spring compression being obtained by adjustment of the turnbuckle. The stabilizer thus provides a resilient means for holding down the tank, and by eliminating the faults of present designs reduces the cost of tank maintenance.

The first tank stabilizer was applied in December, 1930, and over 60 Gulf Refining Company tank cars have since been equipped. Up to date no repairs have been required either to the stabilizers or to the tanks of cars so equipped. The A.R.A. Committee on Tank Cars has recently given approval for the equipping of 135 additional cars with the usual proviso that annual reports indicating service performed be submitted.

Eight Difficult Jobs of Boring and Turning

(*Continued from page 194*)

chuckings. The first chucking consists of seven operations (shown in Fig. 7) as follows:

1—Rough boring surface *F* with main head while side head is rough facing surface *G*.
2—Rough boring surface *A*.
3—Rough turning surfaces *C*, *D* and *E*.
4—True up bore *F* with main head and finish surface *G* with side head.
5—True up bore *A* and recess surface *B*.
6—Ream bores *A* and *F*.
7—Finish surfaces *C*, *D* and *E*.

The time required for the above seven operations, including removing the work, is 35 min.

The second chucking consists of four operations (shown in Fig. 8) as follows:

1—Roughing cut surfaces *H*, *J* and *K*.
2—Rough facing surface *L*.
3—Finish cut surface *L*.
4—Finish surfaces *H*, *J* and *K*.

The time for the above four operations, including removing the work, is 22 min.

Fig. 9 shows the third chucking in which the crosshead is mounted on a special fixture and located by a tapered plug in the wrist-pin hole. The third chucking, consisting of four operations, is as follows:

1—Rough surface *A* with the main head simultaneously with the roughing of surfaces *C*, *E*, and *H* with the side head.
2—Finish radii *B*, *D*, *F*, *G* and *J* with the main and side heads.
3—True up the tapered bore *A* with the main head and finish surfaces *C*, *E* and *H* with the side head.
4—Ream the tapered bore *A*.

The time required for the four operations involved in the third chucking, including removing the work, is 33 min. The total time for finishing the crosshead completely is 1 hr. 30 min. The time given for the several operations in the complete finishing of the crosshead is based upon the assumption that not more than 3/16 in. material is to be removed from any machined surface.

EDITORIALS

Paying for Something You Don't Get

When a railroad company contemplates the purchase of a new machine tool or piece of shop equipment, it is fairly common practice to demand a saving of at least 17 per cent on the investment before any consideration will be given the new equipment. The 17 per cent is arrived at, for example, by setting up interest at 6 per cent, insurance and taxes at 1.5 per cent, depreciation at 4.5 per cent (based on 20 years' life with 10 per cent salvage at the end of the period) and repairs at 5 per cent. Of these four items which in this case make up the 17 per cent, two of them—depreciation and repairs—are open to question and discussion.

Without embarking on any long drawn-out discussion of the question of depreciation of shop equipment the fact remains that regardless of what the railroads may consider an adequate depreciation rate they have never, taken as a whole, charged to operating expense an amount even approaching 4.5 per cent of their investment in shop equipment. It is doubtful whether many roads have even given serious thought to the question of shop equipment depreciation other than to set up an arbitrary rate for the purpose of estimating returns on investment in new equipment. For the purpose of discussion, therefore, an arbitrary rate of 4.5 per cent is assumed to be a fair rate at which equipment would be written off in 20 years, with 10 per cent of its original value as salvage at the end of the period.

In considering the question of repairs to shop equipment we are dealing with a factor about which very little accurate information is available, in spite of the fact that apparently this item is of considerable importance. It is accepted, however, that, as with other mechanical equipment, the cost of repairing machine tools and shop equipment increases considerably with age.

Actual Depreciation Low

Estimates made on as accurate a basis as possible place the value of the railroads' investment in machine tools and shop equipment at an average of approximately 350 million dollars during the ten-year period 1920-1929. Upon such a basis the Class I roads have charged off an average of 1.47 per cent annually in depreciation and have expended an average of 7.15 per cent annually for repairs. The experience of some few roads that have kept records of shop-equipment repair costs indicate that seven per cent represents a fair figure for the average well-managed railroad shop.

It has been stated that the railroads generally do not establish a machine tool depreciation rate, but if the 1.47 per cent is any indication of what has actually taken place, then it must be assumed that mechanical officers hold a rather liberal view of the life of a machine. Some few of our more up-to-date shops show an average age of all machine tools of slightly over 20 years which would indicate that the majority of the shops and enginehouses are equipped with tools considerably older than 20 years.

The statement is frequently made that the reason why railroad shops are equipped with so many old machines is that the machines are still serviceable in spite of their age and that the savings possible on a new machine will not justify the replacement of the obsolete machine. Whether or not a machine can profitably be replaced depends to a large extent upon its age, for with advancing age its productivity as compared with a new machine steadily decreases, while at the same time the cost of maintaining it in service steadily increases. In highly specialized industrial plants many machines five to ten years old are obsolete because of radical changes in processes and were the original value of such machines not charged off before obsolescence, of one kind or another, forces their retirement the undepreciated investment remaining on the books represents a direct loss.

One large manufacturing plant using machine tool equipment similar to locomotive repair shops has for several years followed a policy of depreciating machinery at an annual rate of 10 per cent and using the reserve set-up to purchase new machinery each year. The result is that this plant has no machine tools over 12 years of age at the present time. The most significant fact about this plant is that its average annual expenditure for machine-tool repairs is slightly less than 1.5 per cent of its investment. Compare this with the 7 per cent in the railroad shop where the average machine tool age is over 20 years.

Assuming that railroad shop management had been foresighted enough to establish even a 15-year service life for its machine-tool equipment and that a repair budget as high as 4 per cent were used for the 10- to 15-year old machines, then the average annual repair rate would be 2.3 per cent on the original investment and the annual depreciation rate (for complete write-off) would be 6.6 per cent. On such a basis the railroads would then need to demand a saving of only 16.4 per cent on the investment to justify new equipment.

If all machine tools in the railroad shops were 15 years old or less, and could be repaired for 2.3 per cent annually, as seems to be the case in some modern industrial plants, then the railroads would spend for the maintenance of shop machinery alone some 15 million dollars annually less than they spent on the average during the years 1920 to 1929, inclusive.

Obsolete Tools a Direct Loss

While it is difficult to obtain figures which will substantiate the fact, there is every reason to believe that if accurate cost records of shop equipment repairs were maintained, it would disclose that the railroads are paying heavily for a short-sighted policy of maintaining in service obsolete machine tools and that, if a general policy were adopted of replacing machine tools on a basis of 15 years' service life, their out-of-pocket expenditures would be no greater than is now the case. The acceptance of an inadequate depreciation rate merely tends to continue machine tools and shop equipment in service long after they have reached the end of their economic service life, and the railroads are the direct losers to the extent of an amount equal to the saving that could be made in machine-tool repairs, plus the direct savings in labor which are possible as a result of the greater productive capacity of tools of modern design.

When it is considered that in the 10-year period from

1920 to 1929, inclusive, over 251 million dollars were spent by the Class I railroads for repairs to shop equipment and machinery and that less than 4 per cent of all the money spent for improving railroad facilities during that period was spent for shops and enginehouses, which facilities are used for the maintenance of equipment involving over one billion dollars in 1930, it would seem that the time is at hand when the question of maintenance facilities should be given the attention which its importance warrants.

A thorough study of that phase of railroad operation relating to maintenance of equipment would undoubtedly indicate that the railroads are actually paying out money on maintenance facilities which results in keeping many obsole'e units of equipment in service and deprives them of the benefits which the expenditure of the same amount of money would assure them.

Evidences Of Progress

The past two years or more have been exceedingly difficult for the railroads; indeed, they have had to lead a hand-to-mouth existence and the purchase and installation of new equipment and facilities has been quite impossible. Underneath the surface, however, a lot of hard thinking and planning has been done, the results of which are now becoming partially evident. One clear indication of this may be had by comparing the transportation exhibits at the Century of Progress Exposition this year, with those of a year ago. Moreover, even the casual reader of the newspapers is acquainted with the introduction of the high-speed, streamlined passenger trains and some of the more prosaic advances, such as pick-up and storedoor delivery in the freight traffic department.

Light, High-Speed Passenger Trains

The Union Pacific streamlined train on May 5 ended a two-months exhibition tour, during which it traversed twenty different states and encountered all sorts of climatic and physical conditions. It was visited by well over a million people. No attempt was made to test the train for speed, but it is said to have operated at an average speed well above 70 miles an hour, and in a special test registered 111 miles an hour.

The Chicago, Burlington & Quincy Zephyr has also ended a successful exhibition tour, closing it on May 26 by making the longest high speed passenger-train run on record. The trip of 1,015.4 miles between Denver, Colo., and Chicago was made in 13 hr. 5 min., or at an average speed of 77.5 miles per hour. Both the Union Pacific and the Burlington trains are now on exhibition at the Chicago Exposition.

In addition to the three-car, articulated streamlined train, the Union Pacific, is now constructing three other trains, one composed of six cars, and two others of nine cars each. The first will be driven by a 900-hp. Diesel engine, and the nine-car units will be propelled by 1,200-hp. Diesel engines. Each of these trains will be furnished with specially designed sleeping cars, thus making them available for long over-night runs.

Several other railroads are also indicating an active interest in high speed, streamlined trains. The Baltimore & Ohio, for instance, is building two such trains, one of which will be operated by steam power and the other by an 1,800-hp. Diesel-electric engine, and both of which will be capable of operating at speeds of 90 to 100 miles an hour. A departure has been made from the Union Pacific and Burlington trains, both of which are articulated; the Baltimore & Ohio cars will each be independent units.

A three-car streamlined train has been ordered by the New Haven. It will be operated between Providence and Boston, a distance of 44 miles, in 44 minutes. There are no facilities for turning the train at Providence and it will be necessary to provide for double-end operation. Two power units will be applied, one at each end of the train. The Boston & Maine has ordered 21 suburban passenger coaches to be constructed of light weight alloy steel. These will seat 96 persons and will weigh approximately 84,000 lb. each.

The building of this special passenger equipment seems to have caught the popular imagination, and coupled as it is with the extensive program for air conditioning passenger cars on most of the first-class trains, it has given the impression that the railroads are determined to regain passenger business which has been lost to other types of carriers.

Financing New Equipment

The building of this equipment has been made possible largely by P. W. A. loans to the railroad companies. Money from the same source will also finance the building of considerable other new equipment, as well as the rebuilding and repairing of cars and locomotives, all of which has been helpful in re-vitalizing the railway supply business and getting more men back to work in the railway locomotive and car repair plants.

The new locomotives now under order will include a number of interesting features, and their performance will be watched closely when they are placed in operation. There has been much talk about relegating steam locomotives to the scrap heap; the designers, however, have squarely met this challenge and there is no question but what the new steam locomotives will set a record of performance beyond anything that has yet been accomplished.

Diesel Engines Becoming Popular

Meanwhile, the Diesel and internal-combustion engines have been receiving an unusual amount of attention. This type of power will be used on most of the streamlined, high-speed trains. The Diesel-electric switching locomotives have also been giving a good account of themselves and on the basis of performance several additional units have been ordered by different railroads. This type of power is also being considered for road service.

The Car Construction Committee of the Mechanical Division, A.R.A., two years ago made its recommendations for a standard box car. Samples of these cars have been built and have been thoroughly tested out with excellent results, including a considerable saving in the tare weight of the car. The railroads are beginning to order this new standard car. During the past year, also, the new "AB" type of brake equipment has been adopted as standard and is being placed on all the new freight cars.

Pick-Up and Store Door Delivery

These are only a few evidences of rather radical and distinct improvements which are being made in railway equipment. This progress will undoubtedly be quickened by the fact that the railroads are making a determined effort to build up both freight and passenger business. The pick-up and storedoor delivery of mer-

chandise shipments has been inaugurated in many places and in all probability, as it is extended, will force the consideration of new types of equipment, which will facilitate the handling of these shipments and may, in the last analysis, do away to a large extent with present freight terminal facilities, since ways and means will undoubtedly be found of transferring the shipments directly from the car to the consignee. Co-ordinator Eastman in his report on merchandise shipments, has also suggested that highway and rail services be co-ordinated by establishing concentration stations on the highways, so located that shipments will be gathered at or distributed from these points, the long haul between the concentration stations being done by rail.

Co-ordinator Eastman's Efforts

One of the outstanding features of the year has been the thorough studies of all phases of railroad operation made by Co-ordinator Eastman and his organization. A wealth of material has been assembled, which is being carefully and critically analyzed, and which will be of great assistance in planning to improve the transportation plant and put it on a more efficient and economical basis. In all probability it will demonstrate clearly and beyond question the folly of attempting to operate old, obsolete cars and locomotives. It promises, also, to place squarely before the railroads the question of the advisability of pooling freight car equipment. Mr. Eastman's investigations have even gone into the repair shops, as is shown elsewhere in this issue. Is it good business to attempt to operate old machine tools and shop equipment, or can some of it at least be replaced to advantage by new and modern equipment? These and many other questions will have to be fought out on the basis of facts developed in the studies and researches which are now being made.

Railways Unfairly Dealt With

In light of these facts, it is unfortunate that the Administration at Washington has been so busy that it has neglected to afford much needed relief to the railroads by protecting them from the ruthless competition of other types of common carriers. The rehabilitation of the railroads could be accomplished much more quickly and greater advantage could be taken of the developments which have been referred to, if the other types of carriers that are now subsidized to the disadvantage of the railroads, could at least be subjected to regulation which would place them more nearly on a parity with the railroads. Every impartial group that has made a critical study of this problem agrees that the railroads are being militated against and that something should be done by the government to correct this situation. In spite of all this, and in spite of the promises made by the Administration, the present Congress has been indifferent to the situation.

The railway employees and taxpayers movements in certain parts of the country have been helpful with some of the state legislation, and to some extent have taken an interest in federal legislation, but, unfortunately, not enough pressure has been brought on Washington to force the issue. Apparently, if we are to get anywhere in this respect, every employee of the railroads and every friend of the railroads, must use whatever influence he may have. It is greatly to the interest of the employees to do this, because the success of the other types of carriers in taking business away from the railroads is due in no small degree to the fact that the employees of these carriers are paid lower wages and work under less attractive conditions, than do the employees of the railroads.

Comparing Diesel and Steam Locomotives

The Diesel-electric locomotive has already demonstrated its wide adaptability for switching service, and, judging from experimental development work now well under way, the Diesel prime mover will also soon be a real factor in main-line service. While most railroad men, through long familiarity with the simplicity, reliability and effectiveness of steam locomotives, have a natural preference for this type of power, this preference will in the long run be freely subordinated to the best interests of the railroads in using the type of power which produces the most satisfactory results for the least aggregate cost.

In comparing various types of power for specific transportation requirements, it is self-evident that all factors, such as relative performance, crew wages, cost of fuel, lubricants and water, enginehouse expense, first cost of the equipment, depreciation, maintenance, etc., must be considered before any accurate conclusions can be drawn. Obviously, entirely misleading conceptions may result from comparing the operating cost of a modern Diesel-electric locomotive with that of an old and entirely inadequate steam locomotive, and this point was stressed in the discussion of a paper on Diesel locomotives presented before the April meeting of the Western Railway Club. In this connection, T. R. Cook, manager of inspection and field service, Baldwin Locomotive Works, while specifically advocating the use of that type of power, whether steam, Diesel, or some other kind, which will perform the work required most economically, said:

"I have recently had occasion to compare the operation of an 800-hp. Diesel locomotive with a steam locomotive having the same weight on drivers, namely 230,000 lb. Under this condition, you will find that the horsepower of the steam locomotive passes the horsepower of the oil-electric at 3 m.p.h. With a cut of cars, weighing 500 tons, the oil-electric locomotive will get away ahead of the steam locomotive. The steam locomotive, however, will pass it in less than 20 ft. from the starting point. The steam locomotive will arrive at a kicking speed of 10 m.p.h. in 130 ft. as against the oil-electric in 150 ft. The steam locomotive will require 11.4 sec. to reach 10 m.p.h. against the oil-electric of 16.7 sec.

"In a similar comparison using a 2,000-ton load, again the oil-electric locomotive will start faster than a steam locomotive, the steam locomotive will pass it in 50 ft., will obtain a kicking speed of 10 m.p.h. in 360 ft. against the oil-electric 730 ft., will do this in 46 sec. against the oil-electric 78 sec.

"Again in making comparisons, we have proven, at least to our own satisfaction, that the maintenance costs of all transportation units increase with age. We have definitely determined this rate of increase in so far as the steam locomotive is concerned. We have determined a similar increase in cost of the Diesel locomotive, based on the information published by the A. R. A., this being the only information we found available. Naturally, our study of steam locomotive repairs is based on a considerably greater number of units for a considerably greater length of time. Knowing the increasing cost of maintenance, it is a simple matter to determine the economic life of the unit, i.e., the length of time it should be kept in service before the annual increasing cost of repairs becomes greater than the decreasing amortization charge, and we believe that this is the correct period to use in comparison."

Unquestionably, as pointed out in the discussion at

the Western Railway Club meeting referred to, the Diesel locomotive has a definite place in the transportation field and its favorable progress will be expedited rather than hindered by avoiding any unfair or misleading comparison in specific cases.

Equipment Depreciation Rates

The rate at which equipment depreciation is to be charged to the operating expense accounts has all too generally been considered a matter for accountants and valuation engineers to worry about and of little more than academic interest to mechanical-department officers. However complex theoretical discussions of the subject may become, the use of a depreciation rate and a depreciation account has but one practical purpose and that is to provide a means by which the wastage of capital resulting from the operation of the property may be made good as an expense of the business.

There are at least three means by which the fact that capital is destroyed by time and its processes of change can be accounted for. In addition to depreciation accounting there is retirement accounting by which cumulative wastage is taken into account as an expense in a lump sum at the time a unit of property is finally disposed of by its owner. The third method by which the effect of this wastage is recognized is through the profit and loss account. This is the least desirable of the three methods, since it does not recognize capital wastage as an expense of the business, but as a loss, the effect of which is concealed from the stockholder until he suddenly has to face its full effect at the time final disposition of a unit of property takes place. All three forms of accounting are resorted to with respect to locomotives and rolling stock. In most cases the process involves a combination of depreciation and retirement accounting, with a growing tendency toward the use of depreciation and profit-and-loss accounting during recent years.

The cause of the wastage of capital has been the subject of much discussion and contention among engineers, accountants and lawyers. It is not the result of ordinary wear and tear. This is restored by repairs. In fact, it is physically quite possible to maintain a unit of property—a locomotive or a car—forever. Obsolescence, however, makes this progressively undesirable and ultimately economically impracticable.

The causes of obsolescence are not always easy to determine and have been less easy to evaluate. While the physical deterioration which comes with advancing age can be restored indefinitely, it seems evident that the process becomes constantly more expensive. Hence, in combination with advances in the art which make new units more efficient and capable of more effective performance, as well as the changing character of equipment needed to meet changing service requirements, the effects of advancing age in increasing maintenance costs in themselves become an important factor in producing obsolescence.

In any consideration of the method of accounting by which the wastage of capital caused by obsolescence may be made good, the important question is how fast does obsolescence develop. This is particularly important in the case of depreciation accounting. At the time of the purchase of an order of locomotives or cars how accurately can the rate of development of obsolescence be forecast? Is there, indeed, any good reason why a depreciation rate should be selected which will have completely made good the wastage of capital by the time it becomes desirable to retire a unit of equipment?

Obsolescence develops at varying rates at different times. The advent of steel car construction just before the turn of the century caused a sudden change in the future prospects of all of the rolling stock then in existence. That change in the art caused a rapid increase in the rate at which obsolescence accumulated on cars of wooden construction, while the new steel cars had a prospect of much longer useful life. Similarly, the advent of the stoker, the trailer-borne wide firebox and, more recently, the increase in firebox size permitted by the four-wheel trailer each reduced over night, so to speak, the duration of the prospective useful life of locomotives in existence at the time each of these developments became a fact. The recent advent of new materials of light-weight construction is doing the same to the future life prospects of the existing steel passenger equipment.

The depreciation rates set forth in Co-ordinator Eastman's report on the locomotive inventory of the Class I railroads, based on the form CP-2 questionnaire, indicates an appalling lack of imagination with respect to the future at the time most of these rates were set. An average of 2.19 per cent for the entire inventory, equivalent to an expected life of 46 years, indicates little appreciation of the inevitability of change—change which not only provides better cars and more efficient locomotives, but also destroys the usefulness of the old equipment units.

But why attempt to fix a rate by the exercise of imagination? Why not apply a nominal rate and, when desirable to retire the equipment, make heavy charges to the retirement account? This is obviously what must happen with a rate averaging 2.19 per cent on steam locomotives if the railroads are not to become generally obsolete because of the obsolescence of their motive power. The reason why this should not be done has become strikingly evident during the past four or five years when the managements of a number of railways, facing the issue of cumulative obsolescence in their equipment inventory which had long been side-stepped, found it necessary to resort to profit-and-loss accounting because operating expenses would not stand the heavy lump-sum charges to retirements entailed in the retirement of equipment by the customary accounting methods. The making of these charges in the profit and loss account, thereby reducing the apparent value of the stockholder's property, is an admission that the low depreciation rates of the past have given a false impression of the actual earnings of the property.

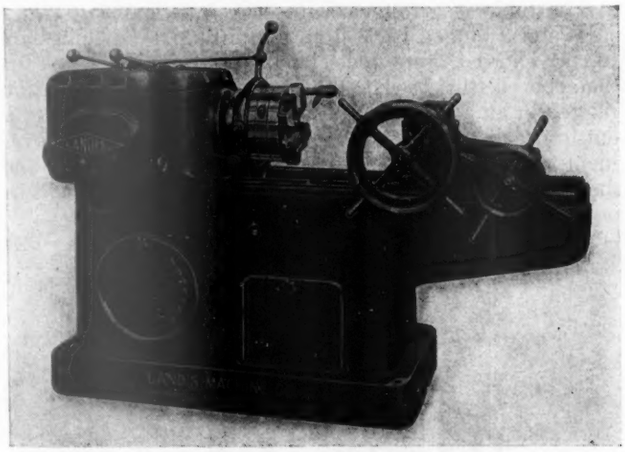
An adequate depreciation rate, even though at times it may completely restore the capital invested in a unit of equipment before it becomes desirable to retire it, will be better for the railways and the public alike than a low rate of depreciation which makes difficult the retirement of units until long after their obsolescence has become a burden on the operation of the property. If the rate is too large, the artificially high operating expense, in theory at least, places an unjustifiable burden on the shipping and traveling public. But if the rate is too low, the excessive cost of maintenance and operation entailed in keeping obsolete equipment in service is just as effective a burden on the shipping and traveling public—except as they chose to transfer their business to other modern transportation agencies. With such agencies now an important factor in the transportation field, the railroads must err on the side of a liberal policy with respect to depreciation to maintain their own competitive position and their ability to continue as an important servant of the public.

New

Shop Tools and Equipment

Threading Machines In Larger Sizes

THE Landis Machine Company, Inc., Waynesboro, Pa., is now offering the Landmaco threading machine in 2-in. and 2½-in. sizes in addition to the 1-in. and 1½-in. sizes built in the past. The new machines have capacities from ½ in. to 2 in. and ½ in. to 2½ in., respectively, and are made in both single-head and double-head models. Both sizes and models can be equipped with lead-screw attachments if desired. The larger threading machines are patterned closely after the smaller machines and have the same distinctive features of design, including the geared headstock with chrome-nickel steel gears, spiral bevel gear spindle drive,



Landis threading machine

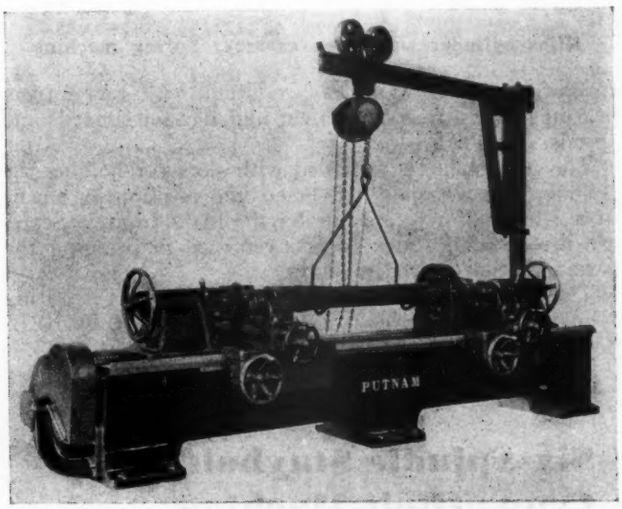
anti-friction shaft and spindle bearings, built-in reversible coolant pump, friction-clutch control, double wall bed, and covered guides. A wide speed range has been provided. All controls are centralized and within easy reach to provide maximum ease of operation.

Car-Axle Burnishing Lathe

THE Putnam Machine Company, division of General Machinery Corporation, Hamilton, Ohio, has recently designed a car-axle burnishing lathe arranged to burnish both journals at the same time. The machine has a carriage and a tail stock at each end, each carriage being fitted with a front and a rear burnishing tool. The burnishing rollers are self adjusting and as only one burnishing speed is supplied, the machine is quite simple. Both tail stocks are adjustable along the bed.

The two burnishing rolls are brought into action by a large screw operating in bronze nut. As the screw is not confined in the carriage end-wise but is free to float, the burnishing tools are forced against the journal with equal pressure and no end thrust is taken by the screw or the carriage. By setting the burnishing tools at a slight angle thev automatically feed themselves along the bed and stop when they strike the shoulder on the axle, thus no feed mechanism is required. The aprons contain only the gears and rack pinion for traversing the carriages by hand.

The machine is driven by a 5-hp. motor running at



Putnam car axle burnishing lathe

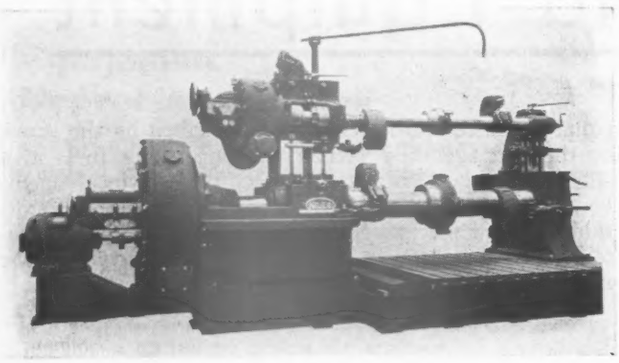
1150 r.p.m. and rotating the axle at a speed of 70 r.p.m. A crane is provided if so desired. The bed is 13 ft. 6 in. long and the floor space occupied is 14 ft. 6 in. by 4 ft. 8 in.

Cylinder and Valve-Chamber Boring Machine

THE Niles Tool Works Company, division of General Machinery Corporation, Hamilton, Ohio, has brought out a two-spindle boring machine designed to bore a locomotive cylinder and its valve chamber at one setting. The machine consists of a heavy bed and upright frame with the main spindle running in a permanent position. This spindle carries a 12-in. boring bar supported in an outboard bearing which is part of the table on which the cylinder casting rests. The height of the bar is 24 in. above the table. The spindle is arranged to be driven by a 25-hp. variable-speed motor running at 750 to 1,500 r.p.m. and geared to provide a main spindle speed of from 4 to 8 r.p.m. There are six feeds to the main bar, ranging from ⅛ in. to ¾ in. per revolution, obtained through a feed box fitted with sliding gears.

The valve chest boring spindle is mounted in a heavy casting and has an up-and-down and in-and-out movement to accommodate itself to the position of the valve

chamber. This spindle is driven by a 15-hp. variable-speed motor running at 775 to 1,550 r.p.m. and is geared to provide a spindle speed of from 8 to 16 r.p.m. The valve-chamber boring bar is 6 in. in diameter. The feeds are four in number and range from 1-16 in. to ½ in. per



Niles cylinder and valve chamber boring machine

revolution. Both spindles are fitted with taper front bearings to insure a smooth cut under heaviest feeds and speeds.

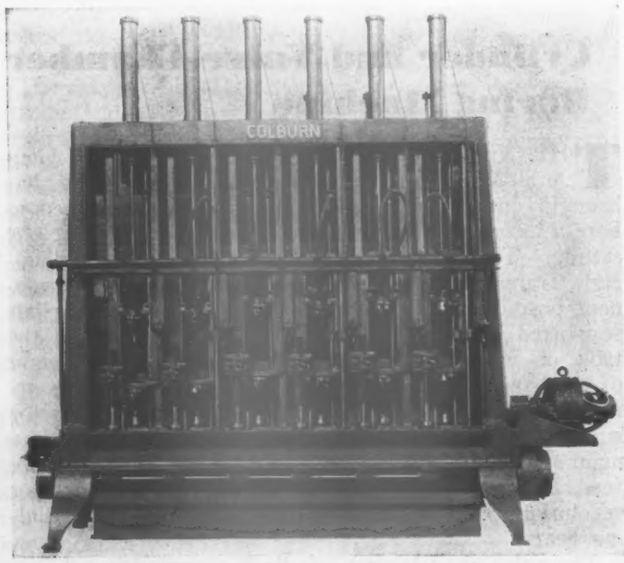
The work table is provided with slots for holding the cylinder and is rapidly traversed into position by means of a 3-hp. motor located under the main frame. Scales are fitted to all slides for convenience in bringing the bars into the desired position.

The floor space required for this machine for boring cylinders cast in halves is approximately 26 ft. by 10 ft. 9 in.

Six-Spindle Staybolt and Crown-Bolt Machine

A NEW design of the Colburn-Harrington six-spindle staybolt and crown-bolt turning and truing machine has been brought out lately by the Consolidated Machine Tool Corporation, Rochester, N. Y. This machine is arranged with three spindles for turning and three for threading, the first spindle to turn, the second spindle to thread, and alternating likewise on the other four spindles. Each head of the machine is equipped with a tandem carriage for the use of stationary self-opening turning and threading heads. The tandem carriages are equipped with air cylinders and separate hand controls for traversing the heads to and from the work. The turning heads are arranged with cutters for facing the underside of bolt-head flanges. The machine is equipped with an air feed and the feed rate is controlled by a dash-pot for the facing operation.

As shown, the machine is designed to be driven by a constant-speed direct-connected motor.

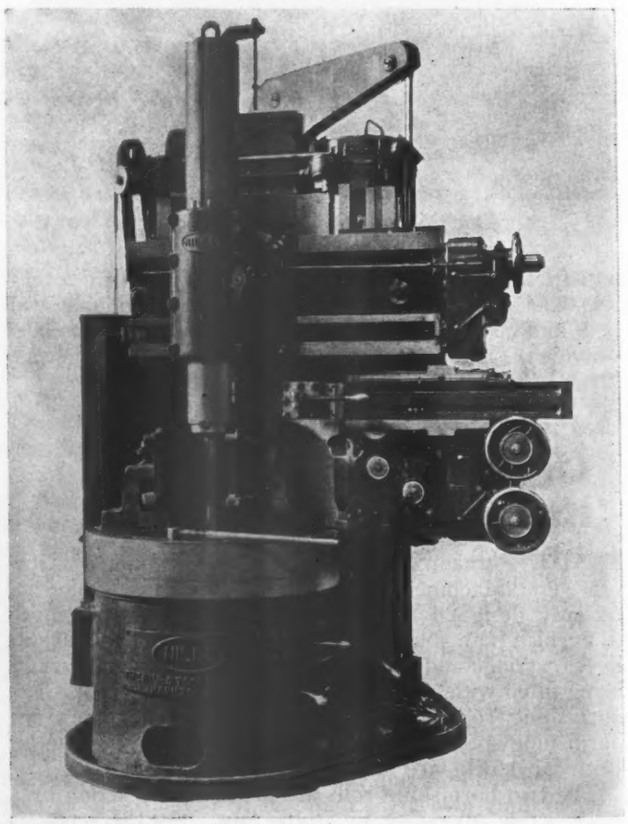


Colburn-Harrington six-spindle staybolt and crown bolt turning and threading machine

Driving-Box Boring, Burnishing and Facing Mill

THE Niles Tool Works Company, division of General Machinery Corporation, Hamilton, Ohio, has designed a special boring bar and self-centering table chuck for its 42-in.—50-in. boring mill, thus adapting it for boring, burnishing, facing and chamfering driving-box brasses ranging from 8½ in. to 13 in. in diameter and up to 21 in. in length.

The table is arranged with two self-centering chuck jaws and a hinged back stop, permitting the driving box to be entered into the chuck and serving also for diameter setting. The boring bar has an extension piloted in an anti-friction bearing in the table. A knock-out is attached to the saddle to limit the downward movement of the bar. The boring and chamfering tools and the burnishing roll are carried in the boring bar as will be noted from the illustration.

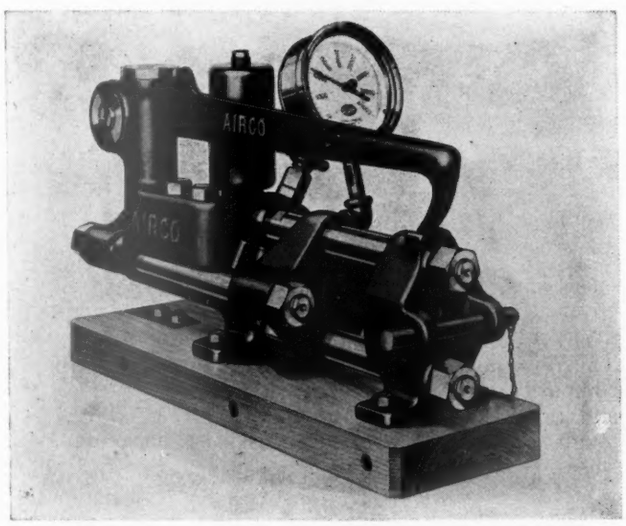


Niles 42-in.—50-in. boring mill fitted with a special boring bar and table chuck for machining driving box brasses

Portable Testing Machine For Welding Work

THERE is a growing demand for accurate knowledge of weld strength as a result of the developments in welding. To make it unnecessary to send specimens to a testing laboratory the Air Reduction Sales Company, 60 East Forty-Second street, New York, has developed the Airco portable tensile and bend testing machine which is a compact, comparatively light machine that can be carried to the welding job so that welded specimens can be tested on the spot, rapidly and easily.

The machine consists essentially of an oil pump, a hydraulically actuated piston or ram, two heads—one fixed and one movable—for gripping the test specimens, and four symmetrically located steel shafts, two of which transmit the piston motion and load to the movable head. The other two shafts maintain the alinement of the two heads and prevent the introduction of bending stresses in the tensile test specimen. By means of a



Airco portable tensile and bend testing machine

long lever attached to the pump and the ratio between the areas of pump plunger and hydraulic ram, the downward force on the pump lever is magnified 400 times in the load applied to the pump lever. This magnification, together with the large piston displacement of the pump, enables specimens to be tested rapidly and with a minimum of effort.

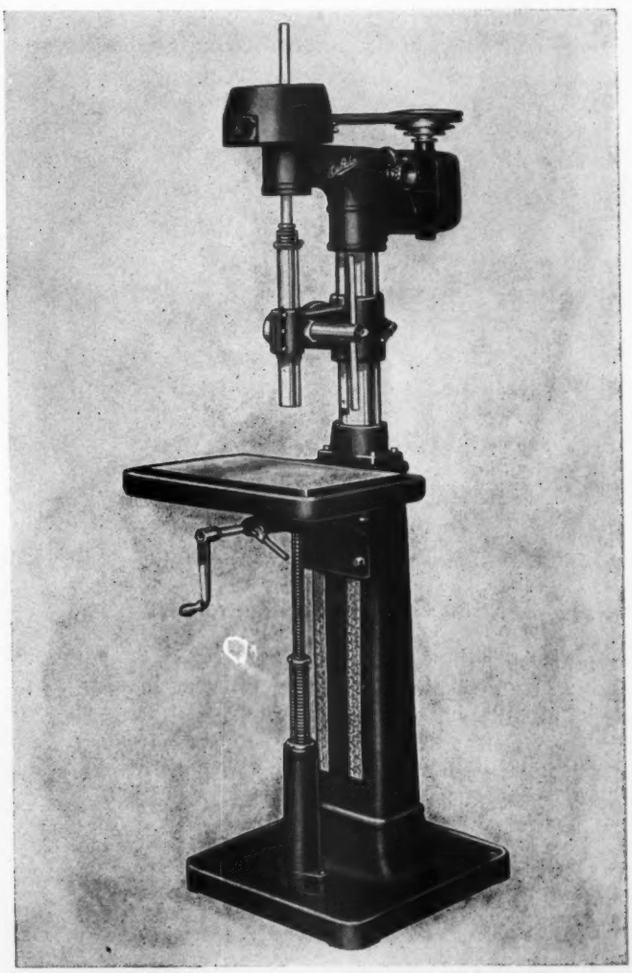
The load on the test specimen is indicated on a 6-in. pressure gage of special construction, carefully calibrated against a standard dead-weight tester. The gage is designed to maintain its accuracy under the strains of usage and shipping. Any good light crank-case oil can be used. The oil chamber is provided with a filter to prevent dust particles from entering the oil passages.

With a few strokes of the operating lever, after the specimen is set up, the operator can apply a direct load up to 40,000 lb. to specimens from 9½ in. to 10 in. long, up to ½ in. thick, and up to 1½ in. wide. Then, by using specimens of smaller cross-sectional areas, loads equivalent to 150,000 lb. per sq. in. or higher can be applied. With reduced size specimens the whole range of various types of steel can be tested. The stroke of the movable head is up to 2¾ in., more than ample for practically any ferrous or non-ferrous metals, and readings are accurate to plus or minus 2 per cent. For the bend test the machine is provided with an anvil which fits into the movable head and which bends the specimen against a pair of supports set 3 in. apart and cast integral with the body of the machine.

An important feature of this testing outfit is its easy portability. A solid hardwood base upon which the machine is permanently mounted forms part of the packing case, sides and top being assembled with screws. A separate box contains the gage carefully packed to protect it in transit. The entire unit, machine and case, weighs only a little more than 200 lb.

16-In. Motor-Driven Ball-Bearing Drill Press

AMONG the new machines recently placed on the market by the Buffalo Forge Company, Buffalo, N. Y., is a line of 16-in. ball-bearing drill presses in which the drive from the motor to the spindle is by



Buffalo 16-in. pedestal type drill press with V-belt drive

means of a V-belt. One design is of the floor type with a 4-in. diameter column on which the table is mounted. The table swivels around the column, may be tilted to

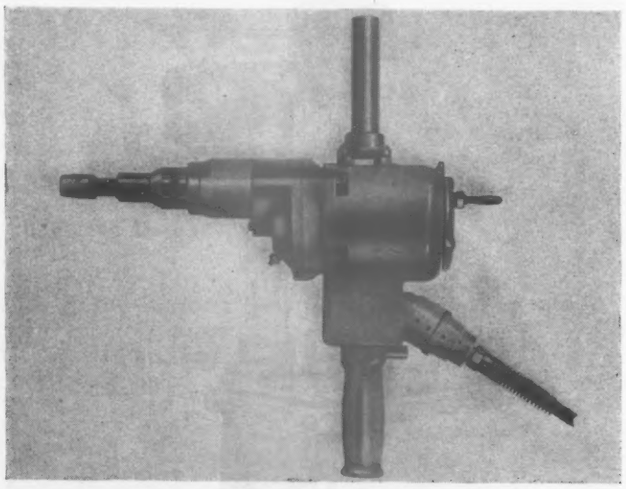
any angle, and has a vertical adjustment of 34½ in. Cup and V-center fittings are furnished for convenience in drilling shafts and odd shapes. Spindle feed is 5¾ in. with depth stop, or 7¼ in. without stop. Another form is the pedestal type (shown in the illustration) which has a table 14 in. by 18 in., with 28½ in. vertical adjustment. Designs are also available for bench mounting. Any model may be furnished with one, two, three or four spindles.

The motor regularly supplied is of ⅓ hp., 1,725 r.p.m. for single-phase, a.c. voltage and cycles as ordered. Other motors may be substituted if desired. The four spindle speeds range from 3,000 r.p.m. for ⅛-in. drills to 400 r.p.m. for ¾-in. drills.

Shockless Nut Runner

A SHOCKLESS high-frequency electric nut runner, with an adjustable releasing clutch which tightens the nut without shock to the operator, is being introduced by the Buckeye Portable Tool Company, Dayton, Ohio.

This clutch operates on a new principle. It is not a friction or jaw clutch, but has an adjustable releasing



Buckeye shockless nut runner

cam which trips open the clutch the instant the nut is tight. The size illustrated, the No. 30-N, is operated by an alternating-current motor, 3 phase, 180 cycles, 225 volts, and a speed of 750 r.p.m. It has a capacity for 5/16 in. and light ⅜-in. nuts. The length is 14 in. and the weight, 16¼ lb.

Cover-All Goggles

A NEW goggle for railroad service has been developed by Willson Products, Inc., Reading, Pa. This Willson cover-all goggle is designed to be worn over spectacles and is furnished in two styles, style CC50 having clear, super-tough (hardened) lenses for general chipping and grinding purposes, and style CW50 having welding lens and cover glass for over-spectacle use by welders. The higher cost of prescription hard-

Willson cover-all goggles

ened lens goggles compared to an over-spectacle or cover-all type, such as this new goggle, and the additional safety afforded have led to their adoption in many places. The Willson cover-all goggle is an anatomically shaped, composition cup goggle, light in weight, well-ventilated, and furnished with a 50 m.m. lens, either clear, super-tough (hardened) or plate glass, welding and cover lenses.

Abrasive Cut-Off Machine

A NEW design of cut-off machine which employs an abrasive cutting disc has been brought out by the Bridgeport Safety Emery Wheel Company, Inc., 1270 West Broad street, Bridgeport, Conn. This machine, known as an "Abrasaw," is said to cut most sections within its capacity faster than by other methods and to cut readily many sections which can be done only with difficulty by other methods. Among the materials readily cut by this machine are such hard and tough metals or alloys as hardened tool steels, high-speed tool bits, drills or drill rods, Allegheny metal, non-ferrous alloys, asbestos products, Bakelite and fiber materials.

A 7½-hp. motor running at a speed of 5,200 r.p.m. drives the disc at a circumferential speed of 16,000 ft. per min. by means of six strands of V-belt of any standard make. The disc regularly furnished is 12 in. diameter, 3-32 in. thick, and has a 1-in. hole. Other sizes may be substituted if preferred. The disc guard is designed to give ample protection and the V-belt drive

is fully enclosed. The disc head and driving motor balance each other on a rocker shaft mounted in Timken bearings, sealed against entrance of grit. The standard vise takes sections up to 2½ in. and may be swiveled to provide for either straight cuts or angle cuts up to 45 deg. A special vise can be furnished for light sections

Bridgeport Abrasaw cut-off machine No. 48

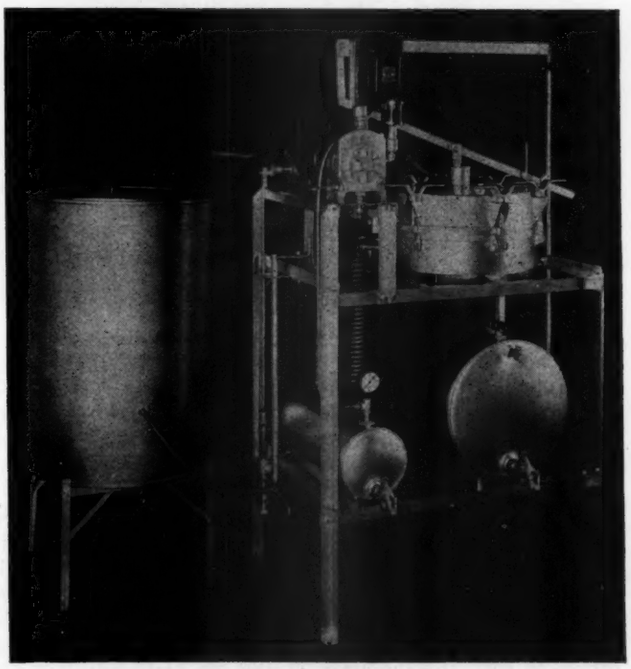
up to 3½ in. diameter. Clamping is accomplished by means of a draw rod and foot pedal, leaving both hands free for operating the swinging crank and handling the material being cut. The work is large and permits of different set-ups that may be required on various jobs. The floor space required is 36 in. by 40 in. and the weight of the machine is 1,020 lb.

Crank Case Oil Reclaimer

WITH the steadily increasing use of rail motor cars the disposition that is made of used crank-case lubricating oil is becoming a matter of even greater economic importance. It is universally known that this oil collects carbon dirt and metallic particles from worn parts of the engine and also becomes thinned by sundry diluents so that its lubricating value is greatly reduced. To keep down wear frequent drainage has become the general practice and the bulk of this used oil has been discarded as a waste product.

A number of years ago the Research Laboratories of the General Electric Company developed a process to cleanse and re-refine discarded crank-case oil on an economic basis. This process was more than filtration; it was rather refining, removing impurities and restoring the oil to its original viscosity and lubricating effectiveness. A license to use the process was obtained by the Hilliard Corporation, Elmira, N. Y. This company thereupon designed and marketed a group of oil reclaimers in three sizes, having a daily capacity of 8, 20 and 50 gallons, respectively. A number of these are installed at railroad shops for reclaiming crank-case oil from rail motor cars. In these reclaimers purification is carried on in two stages or operations. In the first stage the oil is clarified of solid impurities and the acids are neutralized by certain inexpensive chemicals mixed with the oil. The resultant sludge settles down and is carried off by an under-flowing current of water. In the second stage the oil flows over heated surfaces and the diluents are evaporated off.

The Hilliard Corporation has now developed a simplified machine of a small capacity which should extend the use of oil reclaimers into fields where the larger sized machines are not an economical investment. The machine, known as the Hilco oil reclaimer, is illustrated herewith. In operation drained crank-case oil is emptied into the tank at the left which has a capacity of 40 gal. The dirty oil is lifted by the small plunger pump shown near the bottom of the frame and delivered to the filter and evaporator after being preheated to make it run freely. A vacuum pump, driven by a ¼-hp. motor, keeps the system under a high vacuum. The oil is sucked through a bed of filtering material under the filter cover and through filter paper and canvas into the evaporator which forms the lower part of the assembly. The filter material cleans the oil, neutralizes the acid and decolorizes the oil.



The Hilco oil reclaimer

In the vaporizer the oil spreads out in a thin film over an electric heater, the temperature being thermostatically controlled at 380 deg. F. This relatively low temperature results in evaporation of dilution and moisture without any "cracking" of the oil itself. The finished oil runs into the larger tank on the frame from

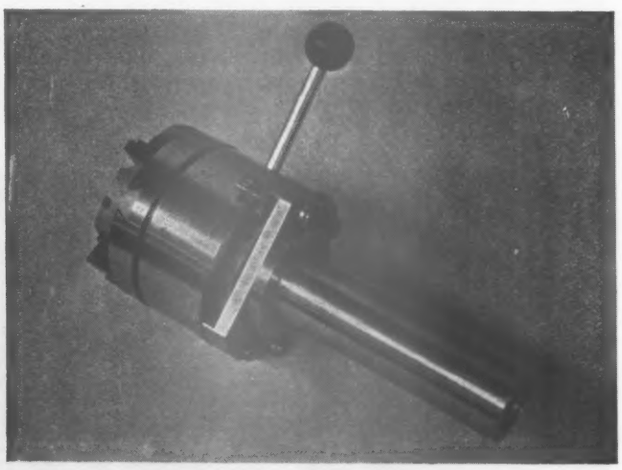
which it is drained off. Vapors coming off are condensed and collected as a penetrating oil in the smaller tank.

The machine, which weighs 600 lb. and occupies a floor space of 24 in. by 37 in., has a capacity of 10 gal. of cleaned oil per day, produced from about 12 gal. of dirty oil. The automatic process is continuous and requires only a brief daily servicing to drain off the clean oil and change the filter.

Stationary Type Tangential Dies

THE Jones & Lamson Machine Company, Springfield, Vt., has brought out a new line of stationary type J & L tangent dies. They are of the pull-off type and have several unique features in addition to those embodied in the J & L revolving type tangent dies, which have been on the market for several years.

The chaser holders are ground and lapped on the dovetails and take a wide bearing surface on the ground and lapped dovetail slots in the die body, as well as on the



Stationary type J & L tangential die

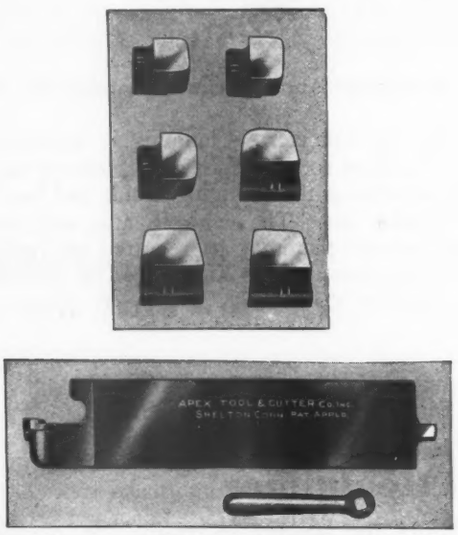
die body face. These holders can be changed, if necessary, without disassembling the die. These dies are locked by pushing the locking lever handle in one direction and may be tripped, when desired, by pushing it in the opposite direction. To make pitch diameter adjustments a spring operated pawl which engages teeth on the adjusting nut is raised and the adjusting nut moved to the proper position. After adjustment the pawl is permitted to settle back in the proper tooth where it securely locks the adjusting nut. The teeth on the adjusting nut permit adjustments of 0.00025 in. In addition to this, the diameter of the die plate adjacent to the adjusting nut is provided with wide-spaced graduations to permit adjustments of 0.001 in.

These dies are equipped with two springs, set up under a pre-determined pressure to permit a cushion start, thus eliminating the solid impact of the chasers and work. The dies are also provided with a longitudinal float which permits the chasers greater freedom to reproduce their own accuracy. The driving flange is screwed onto the shank and dowelled in place, thus affording a drive at a point farthest from the center of the die. This driving arrangement also permits eccentric float to take care of misalinement of the die and work. The amount of eccentric float is determined by the clearance allowed between the outside diameter of a shank integral with the die body and the bore of the outer shank sleeve. On most machines requiring stationary dies, such as hand screw machines, turret lathes and Cleveland automatics, a long shank may be employed. By controlling the float in this long shank the face of the die remains more closely at right angles to the center of the work than is possible when the provision for float is confined to a shorter hook-up.

The chasers for these dies are ground in the thread form at the exact helix angle for the diameter and pitch of the thread to be cut. All chasers are interchangeable in revolving and stationary dies of the same capacity, only one set of chaser holders being required for any right-hand threads within the rated die capacity, whether standard or special, and regardless of diameter or pitch, thus eliminating numerous chaser holders. These new stationary type J & L tangent dies are available in five sizes, with a threading range from No. 8-32 to 2 in. diameter.

Turning and Dressing Car Wheel or Tire Tools

AN inserted tool and holder for turning and dressing car wheels and tires has been developed by the Apex Tool & Cutter Company, Inc., Shelton, Conn. The body of the holder is made of chrome nickel steel, heat treated to toughen it so as to permit of its taking the heaviest shocks. The seat of the holder is hardened, assuring a satisfactory bearing so the tool bit will have a



Apex tool holder and bits for turning and dressing car wheels and tires

perfect seat. This combination of steels is necessary for the conditions each must satisfactorily perform.

The tool bit, which is ground for right- or left-hand use, is inserted from the front of the holder after the lock is loosened sufficiently to allow space for its shank to seat at the shoulder and is first used in the central position slot. It can be drawn in by the screw at the rear of the holder and locked in a firm position within a few seconds. The tool bits are forged of special

analysis high-speed steel or cobalt steel in confined dies. After forging they are finished to size, heat treated and ground, being furnished ready for use. The illustration shows a holder made in standard sizes to fit Niles, Sellers or Putnam wheel lathes, and the standard roughing tools, right or left hand. All tool bits are interchangeable, it being unnecessary to remove the holder from the tool post when changing bits.

A small radius tool is also shown, either right or left hand, which is suited for turning tires or wheels with hard spots or nigger heads. As it will undercut easily and will save considerable regrinding and waste of tool bits, it is recommended as an emergency tool when such conditions arise. The changing of bits is so simple and easy that practically no time is lost in following this procedure.

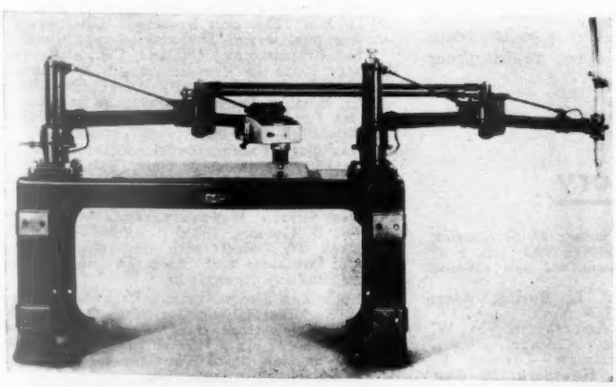
When a tool becomes worn and clearance from regrinding it lost, additional slots or stations for locating the tool bit are provided so that the tool bit is stepped out sideways to the next slot, thereby extending the life three to four times that of an ordinary tool. Considerable additional wear can be had from this adjustable feature. The Apex tool has the rigidity of a solid tool and the combined steels used in the complete unit have greatly improved the cutting and performance ability by applying the proper steels for the particular services each must perform.

A grinding holder or machine fixture for redressing worn tool bits is also available so that tool rooms can maintain the proper angles recommended for the tool bits.

Standard holders are likewise used for the axle lathe with interchangeable tool bits for machining the ⅛ in. and ¾ in. radius required, either right or left hand, without changing the tool bit, and roughers are used in the same holders when necessary.

Pantograph Type Gas-Cutting Machines

THE Air Reduction Sales Company, New York, has added to its line of pantograph type gas-cutting machines two new units, designated as Airco-DB No. 7 Oxygraph and No. 1 Travograph, respectively, which enlarge the range and scope of machine gas cutting. The



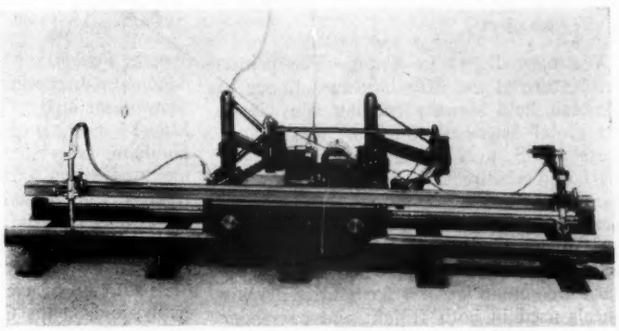
Airco DB No. 7 Oxygraph gas-cutting machine

basic principle of operation of these two machines is the same as that of the No. 6 Oxygraph previously introduced.

The No. 7 Oxygraph, however, employs a different pantograph construction, the fourth side of the parallelogram being removed to the rear. This arrangement allows the working ends of the arms to swing between the vertical posts which support the pantograph assembly, as well as in back of them, and permits covering a maximum cutting area with a given length of arms. No tracer bar is required, the tracer being attached to the end of one pantograph arm and the cutting torch to the end of the other arm. It is designed for single-torch operation only. The tracing table for holding the full-scale drawing is part of the machine and is located on top of the bed between the vertical posts. A manually controlled tracer unit with its adapter is supplied as standard equipment.

In the No. 1 Travograph, the pantograph assembly is mounted on a carrier that travels on rails and thus greatly extends the cutting area. It is fitted with a long tracer bar attached to the outer ends of the pantograph arms. The tracer mechanism and cutting-torch holders are mounted on this bar and may be moved to any position along the bar and secured in place by set screws. As many as six cutting torches may be mounted for multiple cutting. The No. 1 Travograph can also be operated with either manually controlled or magnetic tracer.

Automatic control of the carrier driving motor by the movement of the pantograph arms is a feature of the machine. As these arms reach certain limiting positions in either direction they operate switches which actuate the magnetic reversing starter of the carrier motor. In this way the carrier is automatically positioned to the



Airco DB No. 1 Travograph gas-cutting machine

most advantageous location at all times. The position of the tracing device, its speed and direction of travel automatically control the direction and extent of travel of the carrier.

The electrical circuit provides for giving the carrier driving motor a slow starting speed and smooth pick-up, thus eliminating any jarring of the tracer bar. The motor is of the variable-speed type controlled by adjusting the speed governor screw. At each end of the carrier base a limit switch opens the motor circuit and brings the carrier to a gentle stop. The drive can be disengaged by a clutch, which permits quick positioning of the carrier along the track. The rails on which the carrier runs are 16 ft. long with tops or threads accurately machined. They are bolted to five H-beam sections which serve as ties and supports for the machine. Additional 16-ft. lengths may be added if required.

Straight lines, circles and regular or irregular shapes are cut in steel plate, slabs, billets and forgings by either machine. The cutting area or range of the No. 7 Oxygraph is a 30-in. square or a 36-in. diameter circle, while that of the No. 1 Travograph is a rectangle 4½ ft. in width and 11 ft. in length, with one 16-ft. section, or any length desired with additional rail sections.

Among the Clubs and Associations

MECHANICAL DIVISION, A. R. A.—In view of present business conditions, it has been decided that there will be no annual meeting of the Mechanical Division, A. R. A., for the year 1934. In lieu of an annual meeting the General Committee will hold a meeting at 10:00 A. M., Wednesday, June 27, at the Congress Hotel, Chicago. At this meeting, the General Committee will consider reports from the committees of the Division, and attendance will be limited to the chairmen of committees and sub-committees that have recommendations to submit for consideration. There will be no advance printing and distribution of committee reports, with the exception of the reports from the Arbitration Committee and Committee on Prices for Labor and Materials. Reports will be presented to the General Committee in mimeographed form and only those reports or portions of reports which the General Committee shall direct be submitted to letter ballot or be submitted to the members for information will be printed following the meeting. Any member railroad may be represented at this meeting if they so elect.

WESTERN RAILWAY CLUB.—The principal feature of the fiftieth annual dinner of the club, held Monday evening, May 21, at the Hotel Sherman, Chicago, was an address by Samuel Vauclain, chairman of the board of directors of the Baldwin Locomotive Works. In discussing the subject "What Size Wheels?", Mr. Vauclain presented some unusually interesting figures and slides showing the trend toward a common size for locomotive driving wheels used in both freight and passenger service. He stated that the time is apparently ripe for the adoption of one standard size wheel for road locomotives, namely, 72-in. wheel centers, with 3-in., 3½-in. or 4-in. tires. ¶A brief business meeting of the club was held after the dinner, the following officers being elected for the year 1934-1935: President, A. N. Williams, president and general manager, C. & W. I.; first vice-president, L. Robinson, assistant to general superintendent of motive power, Ill. Central; second vice-president, D. C. Curtis, chief purchasing officer, C., M., St. P. & P.; secretary, C. L. Emerson, division master mechanic, C., M., St. P. & P.; and treasurer, J. W. Fogg, MacLean-Fogg Lock Nut Company. New members were elected to the board of directors, which now consists of: W. A. Bender, master car builder, Alton; J. E. Buker, Vapor Car Heating Company; J. T. Gillick, vice-president, C., M., St. P. & P. H. P. Allstrand, principal assistant superintendent of motive power and machinery, C. & N. W.; C. T. Ripley, chief mechanical engineer, A., T. & S. F.; G. F. Slaughter, American Steel Foundries; P. J. Colligan, general superintendent of motive power, C., R. I. & P.; O. E. Ward, superintendent of motive power, C., B. & Q.; L. R. Wink, assistant superintendent of the car department, C. & N. W.; E. E. Thulin, Duff-Norton Manufacturing Company; F. G. Gurley, assistant to vice-president, C., B. & Q.; and retiring president, J. E. Bjorkholm, assistant superintendent of motive power, C., M., St. P. & P.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—The session of the Railroad Division at the spring meeting of the A. S. M. E., to be held June 25-28 at the Cosmopolitan Hotel, Denver, Colo., will be on Wednesday morning, June 27, at which the following papers will be presented: Light-Weight Stainless Steel Burlington Zephyr, by E. C. Anderson, mechanical engineer, C. B. & Q.; Considerations Relating to the Design of Light-Weight Trains Exemplified by the Burlington Zephyr, by Dr. R. Eksergian, consultant engineer, Budd Manufacturing Company, and The Union Pacific Light-Weight Railway Train of Aluminum Alloy Construction, by A. H. Fetters, general mechanical engineer, Union Pacific System.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—In discussing the subject "Accident Prevention in the Car Department," at the May 14 meeting of this association, W. E. Dunham, superintendent of the car department of the Chicago & North Western, stressed the necessity of continued, faithful efforts if satisfactory results in safety work are to be obtained. He presented some interesting facts and figures showing the reduction of accidents on railroads generally, and on the Chicago & North Western car department in particular, emphasizing the need of adequate instruction in first aid in order to minimize the harmful effect of such accidents as may occur. In this connection, a unique and instructive feature of the evening's program was a demonstration of first aid by a picked team of car-department employees representing the C. & N. W.

Directory

The following list gives names of Secretaries, dates of next regular meetings and places of meeting of mechanical associations and railroad clubs:

AIR-BRAKE ASSOCIATION.—T. L. Burton, Room 2205, 150 Broadway, New York.

ALLIED RAILWAY SUPPLY ASSOCIATION.—F. W. Venton, Crane Company, Chicago.

AMERICAN RAILWAY ASSOCIATION.—Division V.—MECHANICAL.—V. R. Hawthorn, 59 East Van Buren street, Chicago.

DIVISION V.—EQUIPMENT PAINTING SECTION.—V. R. Hawthorn, Chicago.

DIVISION VI.—PURCHASE AND STORES.—W. J. Farrell, 30 Vesey street, New York.

DIVISION I.—SAFETY SECTION.—J. C. Caviston, 30 Vesey street, New York.

DIVISION VIII.—CAR SERVICE DIVISION.—C. A. Buch, Seventeenth and H streets, Washington, D. C.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—G. G. Macina, 11402 Columet avenue, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. Thirty-ninth street, New York.

RAILROAD DIVISION.—Marion B. Richardson, Room 332, 30 Church street, New York. Spring meeting, Denver, Colo., June 25-28.

MACHINE SHOP PRACTICE DIVISION.—R. E. W. Harrison, 6373 Beechmont avenue, Mt. Washington, Cincinnati, Ohio.

MATERIALS HANDLING DIVISION.—M. W. Potts, Alvey-Ferguson Company, 1440 Broadway, New York.

OIL AND GAS POWER DIVISION.—Edgar J. Kates, 1350 Broadway, New York.

FUELS DIVISION.—W. G. Christy, Department of Health Regulation, Court House, Jersey City, N. J.

CAR DEPARTMENT OFFICERS ASSOCIATION.—A. S. Sternberg, master car builder, Belt Railway of Chicago.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—G. K. Oliver, 2514 West Fifty-fifth street, Chicago. Regular meetings, second Monday in each month except June, July and August, La Salle Hotel, Chicago, Ill.

CAR FOREMEN'S ASSOCIATION OF OMAHA, Council Bluffs and South Omaha Interchange.—Geo. Kriegler, car foreman, Chicago, Burlington & Quincy, Sixteenth avenue and Sixth street, Council Bluffs, Iowa. Regular meetings, second Tuesday of each month at Council Bluffs.

CENTRAL RAILWAY CLUB OF BUFFALO.—M. D. Reed, Room 1817, Hotel Statler, Buffalo, N. Y. Regular meeting, second Thursday each month except June, July and August, at Hotel Statler, Buffalo.

INDIANAPOLIS CAR INSPECTION ASSOCIATION.—R. A. Singleton, 822 Big Four building, Indianapolis, Ind. Regular meetings first Monday of each month, except July, August and September, at Hotel Severin, Indianapolis, at 7 p. m. Noon-day luncheon, 12:15 p. m. for Executive Committee and men interested in the car department.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—T. D. Smith, 1660 Old Colony building, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—William Hall, 1061 W. Wabasha street, Winona, Minn.

INTERNATIONAL RAILROAD MASTER BLACKSMITH'S ASSOCIATION.—W. J. Mayer, Michigan Central, 2347 Clark avenue, Detroit, Mich.

MASTER BOILERMAKERS' ASSOCIATION.—A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meeting, second Tuesday in each month, excepting June, July, August and September.

NEW YORK RAILROAD CLUB.—D. W. Pye, Room 527, 30 Church street, New York. Meetings, third Friday in each month, except June, July and August, at 29 West Thirty-ninth street, New York.

PACIFIC RAILWAY CLUB.—William S. Wollner, P. O. Box 3275, San Francisco, Cal. Regular meetings, second Thursday of each month in San Francisco and Oakland, Cal., alternately.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 1941 Oliver building, Pittsburgh, Pa. Regular meeting fourth Thursday in month, except June, July and August, Ft. Pitt Hotel, Pittsburgh, Pa.

RAILWAY FIRE PROTECTION ASSOCIATION.—R. R. Hackett, Baltimore & Ohio, Baltimore, Md. Annual meeting October 17-18, Hotel Stevens, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 1841 Oliver building, Pittsburgh, Pa. Meets with Mechanical Division and Purchases and Stores Division, American Railway Association.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings third Thursday in January, March, May, July and September. Annual meeting, third Thursday in November, Ansley Hotel, Atlanta, Ga.

SUPPLY MEN'S ASSOCIATION.—E. H. Hancock, treasurer, Louisville Varnish Company, Louisville, Ky. Meets with Equipment Painting Section, Mechanical Division American Railway Association.

TRAVELING ENGINEER'S ASSOCIATION.—W. O. Thompson, 1177 East Ninety-eighth street, Cleveland, Ohio.

WESTERN RAILWAY CLUB.—C. L. Emerson, 822 Straus Building, Chicago. Regular meetings third Monday in each month except June, July, August and September.

NEWS

THE CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC has placed on order with the Timken Roller Bearing Company, Canton, Ohio, for bearings and boxes for 50 passenger coaches which the railroad is building in its Milwaukee shops.

THE LOCOMOTIVE FIREBOX COMPANY has received an order from the Delaware, Lackawanna & Western for 20 sets of three syphons each for application to the twenty 4-8-4 type locomotives which this road has ordered from the American Locomotive Company, as reported in the May issue.

THE DELAWARE, LACKAWANNA & WESTERN has placed an order with the Barco Manufacturing Company, Chicago, for float-type low water alarms to be applied to the twenty 4-8-4 type locomotives recently purchased. The Northern Pacific is equipping 10 of its new locomotives with the Barco new water alarm, and five of these locomotives will be equipped with Wilson feedwater conditioners which are using Barco 6-in. flexible connections between the locomotive and the feedwater conditioner on the tank.

Burlington "Zephyr" Non-Stop Run

LEAVING the Union Station at Denver, Colo., at 5:05 a. m. (Mountain Time), on May 26, the "Zephyr," new stainless steel, stream-lined train of the Chicago, Burlington & Quincy, made a non-stop run of 1,015.4 miles to Halsted street, Chicago, in 13 hr. 5 min., or at an average speed of 77.5 miles per hour for the entire distance.

The fuel consumed on the run amounted to 418 gallons, the approximate cost of which was $16.

Not only were innumerable records broken during the course of the run, but also the dependability of the train and of the Burlington track were given a thorough and satisfactory test. The longest previous non-stop run, 401 miles, on the L. M. S. Ry. of England, was exceeded more than two and a half times, and all records for average speed for stretches of 200 miles and over were excelled.

Among the highlights of the speed records were the following:

Maximum speed attained: 112.5 m.p.h.

Yuma, Colo., to Schramm, 6.4 mi., 3½ min., average speed, 109.0 m.p.h.

Otis, Colo, to Schramm, 19.1 mi., 11 min., average speed, 106.2 m.p.h.

Otis, Colo., to McCook, Nebr., 129.5 mi., 86 min., average speed, 90.0 m.p.h.

To compensate for the slower speeds through the larger cities, it was necessary to traverse 215.7 miles at an average rate of more than 90 m.p.h., of which 19.1 miles was traveled at more than 100 m.p.h.

The regular schedule between Denver and Chicago is 26 hr. 15 min. In 1897 a special train, ordered by Henry J. Mayham of Denver, to reach the bedside of his dying son, made a westbound run—from Chicago to Denver—in 18 hrs. 35 min.

An average speed of 80.2 miles an hour was maintained by Zephyr on May 10 on a 140-mile run from Fort Wayne, Ind., to Englewood station in Chicago, over the Pennsylvania. This rate was accomplished against a head wind which measured 39.8 miles an hour at Fort Wayne.

Triumph of Air-Conditioning

THE BALTIMORE & OHIO reports that its Capitol Limited—Chicago to Washington, 825 miles in 17½ hours—traveled through the country-wide dust storm of May 10, throughout the whole of its trip, and the passengers came through in a condition of "complete cleanliness;" in other words, the air-conditioning system, with which the train is equipped, had functioned perfectly. The accumulation of dust in the intake boxes was equal to the quantity usually taken up in two weeks.

A Million Visitors to the U. P. Train

A TOTAL of 1,195,609 persons passed through the Union Pacific's high-speed streamlined train during its two months' exhibition tour of 65 cities. The tour ended on May 5. The train covered a total of 12,625 miles, and traveled on the rails of 14 different railroads, in addition to those of the five units comprising the U. P.

Every sort of climate was experienced. In the East, temperatures as low as 10 deg. below zero were encountered, while on the Pacific coast as high as 92 deg. above was experienced. Snow, high winds, rain and dust storms were met at different points.

The train traveled in every sort of situation. Every grade was made at the highest speed set for it in regular service, some of the grades being as high as five per cent, and all were made at half

Progress in Air-Conditioning Programs

Road	No. of cars	Type of car	Type of system	Builder
B. & O.	16*	Pass.	Built-in duct type	York Ice Machy. Corp.
Union Pac.	1	6-car train†		
	2	9-car train†	.....	Frigidaire Corp.

* These cars have been ordered from the American Car & Foundry Co. as noted in the New Equipment table.

† The order for these trains, as noted in the March issue, was placed with the Pullman Car & Mfg. Corp., through whom the order for air-conditioning equipment has been placed.

New Equipment

CAR ORDERS

Road	No. of cars	Type of car	Builder
B. & M.	10[1]	De luxe coaches	Pullman-Bradley Car Corp.
	21[2]	Suburban	Pullman-Bradley Car Corp.
B. & O.	16[1]	Passenger	American Car & Fdry. Co.
C. G. W.	500[1]	50-ton box	Pullman Car & Mfg. Co.
N. Y. N. H. & H.	3[3]	Articulated Diesel-elec.	Goodyear Zeppelin Corp.

CAR INQUIRIES

D. T. & I.	15	55-ton steel covered hopper, for bulk cement	.....
Pennsylvania Water & Power Co.	1	160-ton transformer	.....
	1	110-ton transformer	.....

LOCOMOTIVE ORDERS

Road	No. of locos.	Type of loco.	Builder
B. & M.	5[4]	4-6-2 pass.	Lima Loco. Works
	5	4-8-2 frt. and pass.	Baldwin Loco. Works
	1[4]	Diesel-elec. road loco. unit or motor car	Bethlehem-Westinghouse
	1[4]	Diesel-elec. road loco. unit or motor car	St. Louis; Ingersoll-Rand; Gen. Elec.
	1	Diesel-elec. switch.	McIntosh & Seymour; American Loco.; Gen. Elec.
	1	Diesel-elec. switch.	Ingersoll-Rand; Gen. Elec.

LOCOMOTIVE INQUIRIES

Aliquippa & Southern	1	0-8-0 switch.	.....
Mo. Southern	1[5]	Oil-elec. or gas-elec.	.....

[1] To be purchased with money loaned by the P. W. A. The B. & O. cars are for the streamlined trains reported in the May issue.

[2] These coaches, which will be financed in part by a loan from the P. W. A., will be of a new type, seating 96 persons. They will be constructed of lightweight alloy steel weighing approximately 84,000 lb. as compared with a weight of 130,000 lb. of the latest type coaches now in service. The cars will be equipped with roller bearings, and will have insulated trucks. The ten de luxe coaches will also have insulated trucks and roller bearings and will be air conditioned.

[3] According to the announcement of the New Haven these cars will constitute a train which will be built of Duralumin, ultra streamlined and air conditioned throughout. The cars will be suspended on shock absorbers, and will have a Diesel-electric power unit at each end. The floor height above the rail will be 31¼ in., only two shallow steps being necessary to enter the car. The car will be approximately 11 ft. 3 in. high, this being about 20 per cent lower than present standard equipment.

[4] The five new 4-6-2 type locomotives will be equipped with boosters. The two Diesel-electric road locomotive units or motor cars, each of 800 hp. will be of streamlined design. They will be of a three-compartment type, the forward compartment containing the motive power equipment, the middle a mail-handling compartment, and the rear a baggage compartment. Each of the units will be capable of hauling five coaches as trailers. P. W. A. allotments have been made for the equipment to be purchased by the B & M.

[5] To be financed in part by a loan from the P. W. A.

throttle. From sea level the train went to altitudes as high as that of Sherman Hill, Wyo., 8,013 ft. above sea level. At no time did the train need assistance of any kind.

No attempt was made at any time to test the train for speed. However, it was run on the schedules of the fastest trains of the different railroads traversed. Just west of North Bend, Neb., the train did one mile in 33 sec., a rate of 109.3 miles per hour. Its general average speed was well above 70 miles and most of the running between stations was at about 80 miles an hour. In a special test run recently the train registered 111 miles an hour.

On April 19, the train made its first revenue trip—a two-day tour to Gering, Neb., sponsored by the Omaha Chamber of Commerce.

P. W. A. Loans to Railroads

THE PUBLIC WORKS ADMINISTRATION has announced that actual disbursements to the amount of $43,590,000 had been made by it up to May 15 on its loans to railroads, on allotments amounting to $199,607,000. The borrowing companies draw their loans down as they require money to meet payrolls on work being done by their own forces and to pay for materials, rails, engines, and cars, as del vered. Material and rail manufacturers, and locomotive and car builders, finance themselves until they are ready to make delivery. At delivery time the railroads requisition money from the P. W. A. and pass it along to the manufacturers. Approximately $85,000,000 of the allotments is being used for new cars and locomotives.

Equipment repair, which is but a small part of the P. W. A. railroad program, will result in the payment of $11,525,000 in wages to railroad shopmen who make the repairs and the purchase of $15,790,000 worth of materials.

Loans for equipment repairs have been made to the following railroads: Baltimore & Ohio; Boston & Maine; Delaware, Lackawanna & Western; Great Northern; Illinois Central; Lehigh Valley; Southern Pacific; Chicago, Milwaukee, St. Paul & Pacific; New York, New Haven & Hartford; Wabash (receivers); Erie; Interstate. In the shops of these companies 1,552 locomotives, 1,956 passenger cars and 33,323 freight cars will be repaired.

Among the more recent contracts signed are the following:

Boston & Maine.—$1,550,000 to be used for a general program of roadway improvement. This is the third such loan to the Boston & Maine to be placed under contract. A fourth contract calling for a loan of $2,628,000, to be used for the purchase of new locomotives and cars, is in course of preparation. The total of all four loans will be $7,318,000.

Chicago Great Western.—$1,200,000 for the purchase of 500 box cars.

Delaware, Lackawanna & Western.—$1,043,000 for conversion of a locomotive and cars.

Grand Trunk Western.—$250,000 for rail and fastenings.

Great Northern.—$850,000 for rebuilding 650 refrigerator cars in its shops at St. Cloud, Minn. This is the second contract signed for this road, the first being for $4,935,000 as noted in the April issue.

Gulf, Mobile & Northern.—$210,000 for the building of 100 freight cars.

An allotment of $36,000 has also been made to the Missouri Southern to be applied toward purchase of a Diesel-electric locomotive.

Supply Trade Notes

THE VAPOR CAR HEATING COMPANY, INC., has moved its office from 75 West street to 230 Park avenue, New York City.

J. G. WALLACE, representative of the railway sales division of The Texas Company (California), Hearst building, San Francisco, Cal., has been appointed assistant district manager.

A. F. KING, formerly with the Buffalo, N. Y., and Philadelphia, Pa., district sales offices of the Reading Iron Company, has been transferred to Boston, Mass., as district sales representative, succeeding John G. Ross, who has resigned.

THE RAILS COMPANY, 50 Church street, New York, has been appointed general sales managers for the Sterling Fibre Company, Waltham, Mass., manufacturers of car seats and wool padding material. The offices of the Rails Company were formerly at 405 Lexington avenue, New York.

GEORGE H. ORD has been appointed eastern sales manager, with headquarters at 501 Fifth avenue, New York, of the Ewald Iron Company, Louisville, Ky. Mr. Ord was for many years vice-president of The Ellcon Company, New York, and sales representative of the Morton Manufacturing Company, Chicago.

SAMUEL E. HACKETT, vice-president in charge of sales of the Jones & Laughlin Steel Corporation, has been elected president, with headquarters at Pittsburgh, Pa. Mr. Hackett succeeds George Gordon Crawford, who has resigned as president but will continue as a director and a member of the executive committee.

J. F. FRANEY has been appointed sales manager of the Pilot Packing Company, with headquarters in the Peoples' Gas Building, Chicago. Mr. Franey will have

J. F. Franey

full charge of sales in the Chicago and adjacent territory. He served an apprenticeship as a machinist with the C. B. & Q. and later was with the American Locomotive Company at its Schenectady, N. Y., works on a special assignment. He then was appointed general foreman on the N. Y. C. and subsequently was mechanical inspector on the L. & N. During the war he was with the American Brake Shoe & Foundry Company, at Erie, Pa., engaged in supervising the manufacture of munitions. He left that company to go to the D. & R. G. in charge of its Denver, Colo., shops. For the last seven years Mr. Franey has been engaged in selling and servicing mechanical engine packings to railroads in the Chicago territory.

H. L. ANDREWS, Erie, Pa., has been elected a vice-president of the General Electric Company, in charge of the activities connected with the electrification of steam railroads and such other duties as may be assigned to him by the presi-

H. L. Andrews

dent. Mr. Andrews was graduated from the University of Missouri in 1910, and the same year entered the testing department of the General Electric Company. In 1912, he was transferred to the railway motor department and in 1916 to the railway engineering department. A year later he was placed in charge of car equipment. Late in 1925 he was appointed assistant engineer in administrative charge of the department and in 1929 became engineer. Recently he has also been responsible for general commercial matters in the transportation field, and now is vice-president in charge of the activities connected with the electrification of steam railroads and such other duties as may be assigned to him by the president.

R. B. MILDON, who has been elected vice-president of the Westinghouse Electric & Manufacturing Company, with headquarters at South Philadelphia, Pa., in charge of the operations of marketing, engineering, manufacturing and service in connection with the products of the South Philadelphia works, was graduated from the civil engineering school of Cornell University in 1900. Shortly thereafter he was employed by the Union Pacific and the Colorado Fuel & Iron Company in an engineering capacity. In 1906 he was appointed chief engineer of the Duquesne Mining Company, and three years later became associated with the Westinghouse

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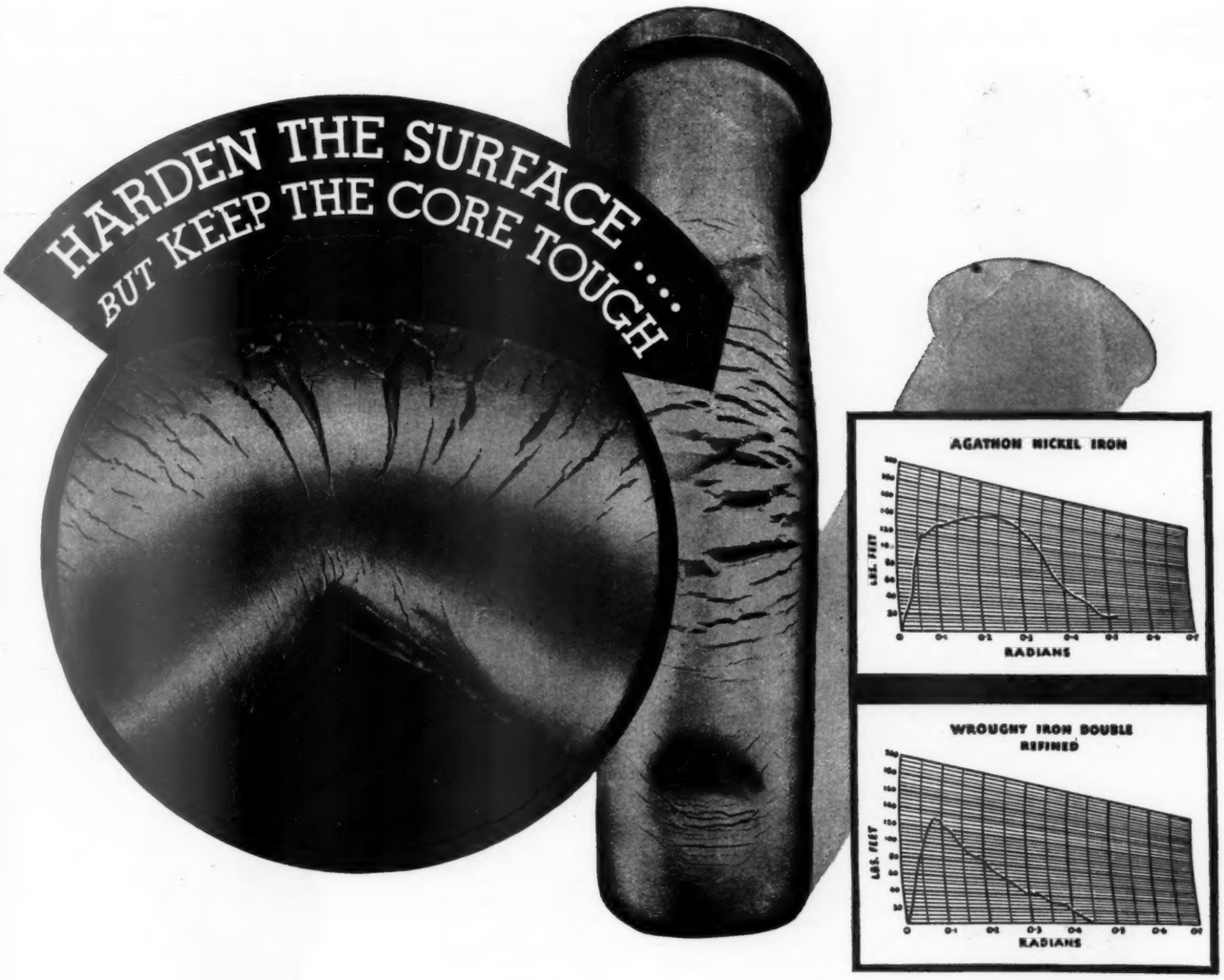

Wearing parts such as valve motion pins and bushings need a glass hard surface for long life with an interior toughness to resist shock. » » » How well Republic metallurgists succeeded in developing in Agathon Nickel Iron a material that combines these conflicting qualities is shown in the above curves. » » » The Humphrey Machine which produced these charts, bends the full section to the breaking point of the case and then on to final rupture. The first break in the line indicates the point at which the case was first cracked; the rest of the curve shows the resistance of the core to rupture. » » » The core of the wrought iron shows rapidly diminishing resistance as the angle of bending increases. » » » Agathon Nickel Iron, on the other hand, shows stubborn resistance even after the case is broken. The core is tougher and uniform in composition. » » » Use Agathon Nickel Iron for all case-hardened parts. » » » » » » » » » » » » »

Toncan Iron Boiler Tubes, Pipe, Plates, Culverts, Rivets, Tender Plates and Firebox Sheets • Sheets and Strip for special railroad purposes • Agathon Alloy Steels for Locomotive Parts • Agathon Engine Bolt Steel • Agathon Iron for pins and bushings • Agathon Staybolt Iron • Climax Steel Staybolts • Upson Bolts and Nuts • Track Material, Maney Guard Rail Assemblies • Enduro Stainless Steel for dining car equipment, for refrigeration cars and for firebox sheets • Agathon Nickel Forging Steel.

CENTRAL ALLOY DIVISION, MASSILLON, OHIO

REPUBLIC STEEL
CORPORATION
GENERAL OFFICES YOUNGSTOWN, OHIO

AGATHON NICKEL IRON

company in charge of the gas producer department of its machine works at East

R. B. Mildon

Pittsburgh, Pa. In 1912 he was transferred to the Westinghouse Air Spring Company and in 1916 re-entered the employ of the Westinghouse Electric & Manufacturing Company as assistant to vice-president. Recently he had been in charge of the stoker department.

ARTHUR H. SMITH, formerly vice-president of the Railroad Materials Corporation, has joined the Youngstown Sheet & Tube Company, Youngstown, Ohio, as special representative of railroad sales in

Arthur H. Smith

the East. Mr. Smith will have his headquarters at New York, and will cover the territory east of Youngstown from Maine to Florida. He is well acquainted with steel and railroad men throughout the country, having been connected with railroad sales almost continually since 1912, when he joined the Railroad Supply Company, at New York. In 1917, he left that company to join the army; he returned from the war in 1919 and became assistant to the vice-president. In 1930, he was appointed vice-president of the Railroad Materials Corporation, remaining in that position until joining the Youngstown Sheet & Tube Company.

THE HEYWOOD-WAKEFIELD COMPANY, Boston, Mass., has purchased the complete physical assets of the car seat business of the Hale & Kilburn Company, Philadelphia, Pa. Production of the latter company's seats and chairs will in the future be combined with the Heywood-Wakefield car seat activities at its Gardner, Mass., plant and at its general office in Boston, Mass. Walter M. Swope, formerly general manager of sales of Hale & Kilburn, represents the enlarged Heywood-Wakefield car seat interests, with headquarters at Philadelphia. Alfred B. Bell, formerly chief engineer in charge of seat design and engineering of the Hale & Kilburn Company, will become associated in the same capacity with the Heywood-Wakefield Company at the Gardner plant, as also will Otto G. Wolf, formerly chief estimator of Hale & Kilburn, with many former members of the Hale & Kilburn staff. Complete and prompt service on all Hale & Kilburn seat assemblies and parts will be maintained by the Heywood-Wakefield Company. The Hale & Kilburn Company's tools, dies, patterns and equipment are now in course of installation in the Heywood-Wakefield plant.

Obituary

B. F. MOORE, who retired as assistant to the vice-president of the Illinois Steel Company, Chicago, in 1932, died in Evanston, Ill., on May 25 following a paralytic stroke.

GEORGE C. MILLER, for about 10 years previous to 1919 vice-president of the Galena Signal Oil Company, now the Galena Oil Corporation, died on May 29 at his home in Miller Park, Franklin, Pa., at the age of 76 years.

CHARLES E. HALE, who died at Philadelphia, Pa., on April 16, was born at Elkhart, Ill., on April 21, 1879. Later he went to Chicago where he graduated from the grade schools. He then entered the Michigan Military Academy, from which he was graduated in 1899. In 1916 he entered the railway supply business with the

Charles E. Hale

Duff Manufacturing Company, and in 1919 became connected with the Baldwin Locomotive Works. From 1923 to 1929 he was manager of the Baldwin office at Pittsburgh, Pa., and was later located at Chicago. In 1932 Mr. Hale returned to the home office in Philadelphia where he was in active service until a few weeks before his death.

WILLIAM ELLIS COREY, who was from August, 1903, to January, 1911, president of the United States Steel Corporation, died on May 11 at his home in New York at the age of 68 years. Mr. Corey was a director of a number of industrial organizations, including the Baldwin Locomotive Works and the Vanadium Corporation of America. He was a member of the American Iron & Steel Institute, Iron & Steel Institute of Great Britain and American Institute of Mining Engineers.

OLIVER HARRY NEAL, eastern representative in New York City for the Union Asbestos & Rubber Company and the Equipment Specialties Company, died at Tucson, Ariz., on April 15, after a long illness. Mr. Neal was born at Baltimore, Md., on October 10, 1889. He served with the Baltimore & Ohio from January 9, 1907, to April 23, 1913, in capacities of machinist apprentice, machinist helper, machinist and fuel inspector. He resigned from that service and entered the employ of the Locomotive Lubricator Company, Chicago. On January 1, 1925, he entered service of the Union Asbestos & Rubber Company and Equipment Specialties Company.

RAYMOND BOISELLE, representative of the Westinghouse Air Brake Company at New York, died on May 22 in a hospital at Reading, Pa., at the age of 43, from injuries received in an automobile accident on May 11. Mr. Boiselle was born on May 18, 1891, at Hoisington, Kan. His

Raymond Boiselle

mechanical engineering education was received at the University of Illinois and his early practical experience with the Missouri Pacific, the Atchison, Topeka & Santa Fe, and the Chicago, Rock Island & Pacific. He entered the service of the Westinghouse Air Brake Company in 1912 and was employed in the test department until 1917. During the World War he served overseas as first lieutenant and captain, Aerial Armament Division. After the armistice he was appointed mechanical expert in the southwestern district of the Westinghouse Air Brake Company, with headquarters at St. Louis, Mo. He became representative in the Pittsburgh district in 1923 and four years later was appointed representative of the Boston territory, with headquarters at Boston, Mass. He became steam road representative at New York in 1929.

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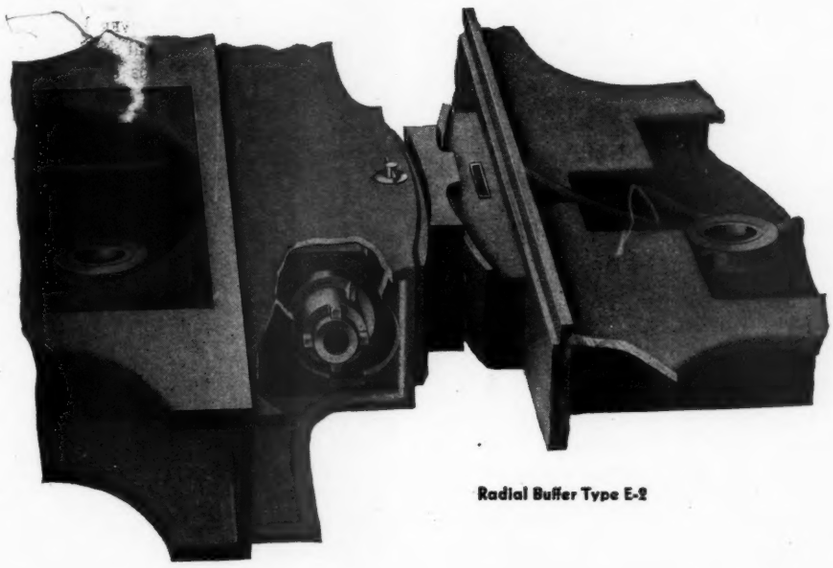
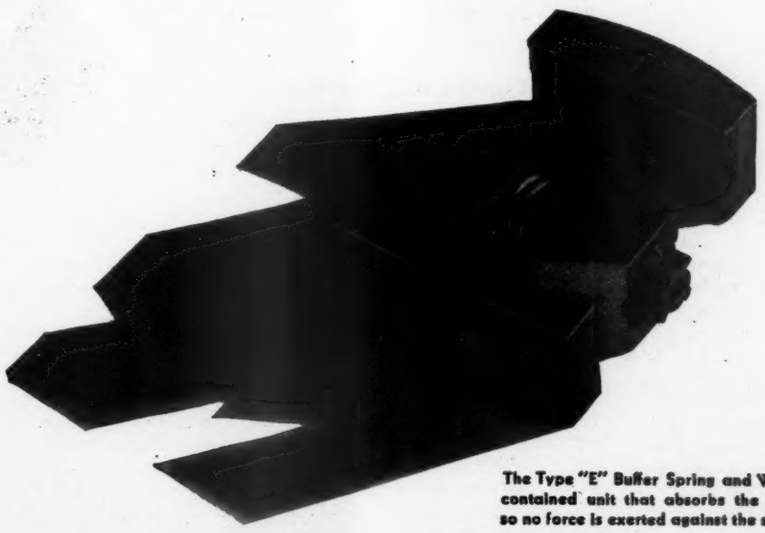
200,000 MILES
WITHOUT APPRECIABLE WEAR



Radial Buffer Type E-2

For over 200,000 miles a Franklin Type "E" Radial Buffer has been in service on a large Eastern Railroad. It is still as effective as the day it was applied; wear has been negligible. « The transverse, spring controlled, frictional resistance of this design has stopped synchronized oscillation between engine and tender and has made a fine riding locomotive as well as prolonging the life of buffer springs and wearing surfaces.



The Type "E" Buffer Spring and Wedges form a self-contained unit that absorbs the stress within itself so no force is exerted against the sides of the pocket.

Because material and tolerances are just right for the job, genuine Franklin repair parts give maximum service life.

FRANKLIN RAILWAY SUPPLY COMPANY, INC.

NEW YORK CHICAGO MONTREAL

Personal Mention

General

D. J. MULLEN, superintendent of motive power of the Cleveland, Cincinnati, Chicago & St Louis, has been appointed superintendent of equipment, with jurisdiction over motive power and rolling stock departments (other than shop operation) and headquarters at Indianapolis, Ind.

F. K. MURPHY, assistant superintendent of motive power of the Cleveland, Cincinnati, Chicago & St Louis, has been appointed assistant superintendent of equipment, with jurisdiction over the motive power and rolling stock departments (other than shop operations) and headquarters at Indianapolis, Ind.

DAVID LEE FORSYTHE, general road foreman of equipment of the St. Louis-San Francisco, has been retired, after 46 years of continuous service. Mr. Forsythe was born on March 27, 1864, at Little Rock, Ark. He attended high school at Little

D. L. Forsythe

Rock and in October, 1882, became a fireman on the St. Louis, Iron Mountain & Southern. He entered the service of the Kansas City, Memphis & Birmingham (now a part of the St. Louis-San Francisco) on November 20, 1887, as a fireman, on February 20, 1889, being promoted to the position of engineman. He was appointed road foreman of equipment in July, 1906; assistant master mechanic in September, 1911; master mechanic, July, 1913; road foreman of equipment, November, 1915; inspector of train and station service, December, 1916; road foreman of equipment, Southern Division, April 1, 1918, and general road foreman of equipment, July, 1923. Since 1926 he has supervised several tests in which locomotives were run 2,940, 7,350, and 9,743 miles, respectively, without fires being knocked. Mr. Forsythe is at the present time third vice-president of the Traveling Engineers Association and vice-president of the Frisco Veterans' Association.

R. N. MCKITTERICK, enginehouse foreman of the Atchison, Topeka & Santa Fe at Emporia, Kan., has been promoted to the position of fuel supervisor, with headquarters at Amarillo, Tex.

Master Mechanics and Road Foremen

F. D. WARNER, master mechanic of the Canadian Pacific at Calgary, Alta., has been transferred to Saskatoon, Sask.

J. P. KELLY, master mechanic of the Canadian Pacific at Saskatoon, Sask., has been transferred to Calgary, Alta.

RICHARD SMITH has been appointed master mechanic of the Missouri Pacific at Memphis, Tenn., with jurisdiction over the Union Railway of Memphis and the Memphis division.

E. A. SCHRANK, general foreman in the locomotive department of the Chicago, Burlington & Quincy at Galesburg, Ill., has been promoted to the position of master mechanic of the McCook division, with headquarters at McCook, Neb.

F. R. BUTTS, assistant master mechanic of the St. Joseph division of the Chicago, Burlington & Quincy at St. Joseph, Mo., has been appointed master mechanic of this division and the position of assistant master mechanic has been abolished.

E. R. HANNA, master mechanic of the Missouri Pacific at North Little Rock, Ark., has been relieved of jurisdiction over the Union Railway and the Memphis division, but will continue as master mechanic of the Arkansas division.

Shop and Enginehouse

H. MODAFF, acting superintendent of shops on the Chicago, Burlington & Quincy at West Burlington, Iowa, has been appointed superintendent of shops at that point, succeeding W F. Ackerman, deceased.

Purchasing and Stores

A. H. LILLENGREN, acting purchasing agent of the Great Northern, with headquarters at St. Paul, Minn., has been appointed purchasing agent at that point.

C. E. WALSH, purchasing agent of the Pennsylvania, with headquarters at Philadelphia, Pa., has been promoted to the position of general purchasing agent. Mr. Walsh was born at Uhrichsville, Ohio, on September 20, 1882. He started his railway career as storeroom clerk for the Pittsburgh, Cincinnati, Chicago & St. Louis (now part of P. R. R.) in May, 1899. Subsequently, from November, 1901, to January, 1913, he served with the Pennsylvania in various clerical positions in the office of the purchasing agent, as assistant chief clerk to the purchasing agent, and as chief clerk in the same department. In June, 1914, he was appointed assistant purchasing agent at Pittsburgh, Pa. He was placed in charge of the purchasing department of the Pennsylvania, Lines West of Pittsburgh, from February, 1918, until March, 1919, during the absence of the purchasing agent. In March, 1920, he became asssitant purchasing agent of the Central region, with headquarters in Pittsburgh, and in January, 1924, was transferred in the same capacity to Philadelphia. Mr. Walsh was promoted to the position of purchasing agent of the Pennsylvania in January, 1927, serving similarly also on the Long Island and the Baltimore & Eastern.

Obituary

ROBERT J. TURNBULL, assistant to general superintendent of motive power of the Atlantic Coast Line at Wilmington, N. C., died at his home in Wilmington, on April 28.

JOHN W. SENGER, assistant superintendent of equipment of the New York Central, with headquarters in Cleveland, Ohio, died at his home in that city on May 20. Mr. Senger was 64 years of age. He entered the service of the New York Central on September 15, 1883, as a messenger at Cleveland, Ohio. He later served as yard foreman, general foreman and supervisor of materials for the same road and as master car builder at various points. In March, 1920, he was appointed superintendent of rolling stock, Lines West of Buffalo. In November, 1931, Mr. Senger's jurisdiction was extended to include also the Ohio Central lines. He served in this latter position until May 1 of this year, at which time the mechanical department of

J. W. Senger

the New York Central was re-organized and Mr. Senger became assistant superintendent of equipment at Cleveland.

H. H. PARKER, master mechanic of the Norfolk-Portsmouth Belt Line, died at Portsmouth, Va, on May 11 after an illness of several months. Mr. Parker, in 1931, aroused by the great harm done to the railroads by unregulated and undertaxed bus and truck competition, began in his home city, Portsmouth, Va., to expound his views to railroad employees and, as a consequence, a so-called 'Railroad Employees and Taxpayers Association was organized at that point with Mr. Parker as its president. The movement became state-wide in Virginia and thence spread to many other states. Mr. Parker was born in' Wilmington, N. C., and prior to his service with the Norfolk-Portsmouth Belt Line, was in the employ of the mechanical department of the Seaboard Air Line.